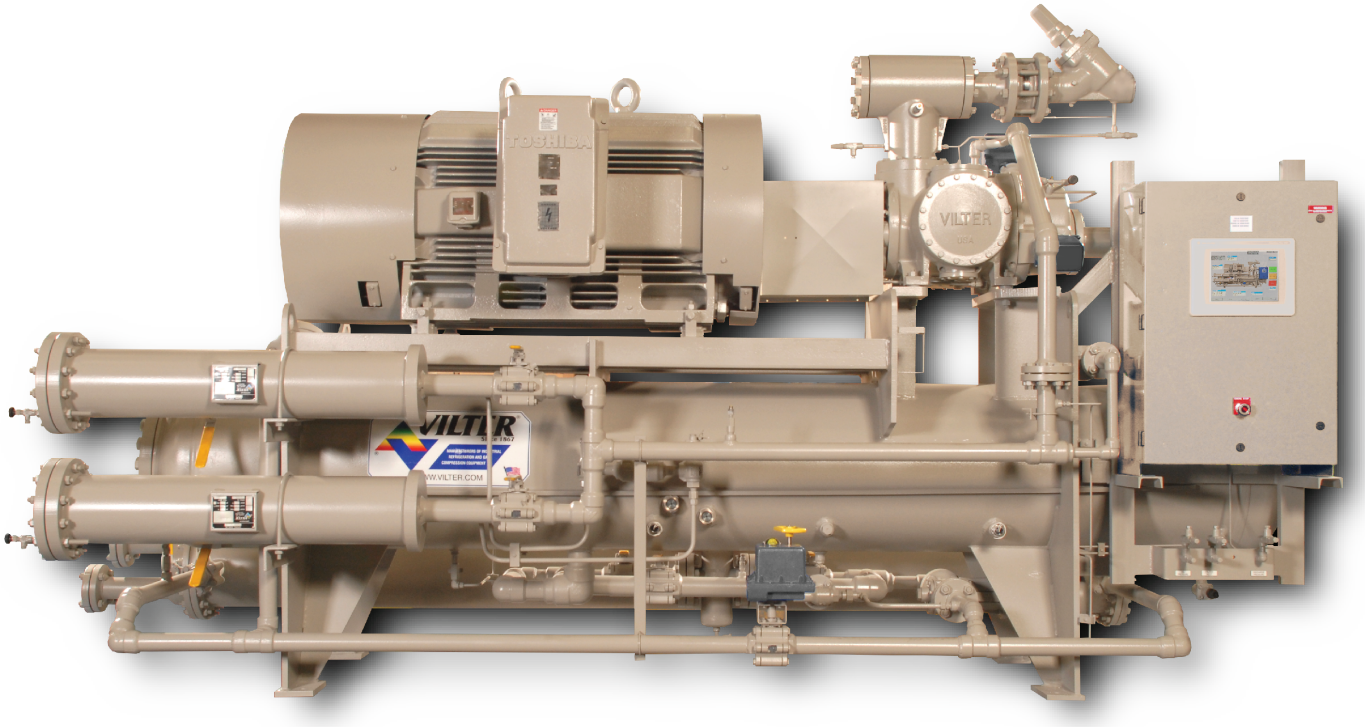
VSG & VSSG
Single Screw Compressor Unit

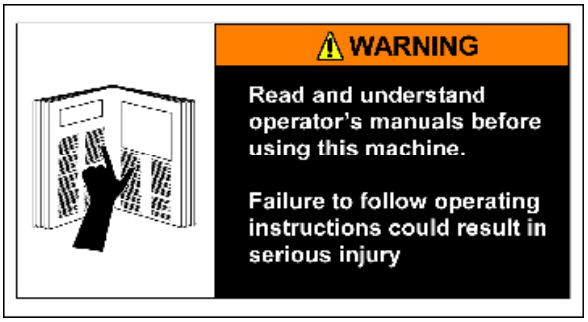
The World's Best Compressors™
For Gas Compression



VILTER® Since 1867

EMERSON™ Climate Technologies

Important Message



READ CAREFULLY BEFORE INSTALLING AND STARTING YOUR COMPRESSOR.

The following instructions have been prepared to assist in installation, operation and removal of Vilter Single Screw Compressors. Following these instructions will result in a long life of the compressor with satisfactory operation.

The entire manual should be reviewed before attempting to install, operate, service or repair the compressor.

A compressor is a positive displacement machine. It is designed to compress gas. The compressor must not be subjected to liquid carry over. Care must be exercised in properly designing and maintaining the system to prevent conditions that could lead to liquid carry over. Vilter Manufacturing is not responsible for the system or the controls needed to prevent liquid carry over and as such Vilter Manufacturing cannot warrant equipment damaged by improperly protected or operating systems.

Vilter screw compressor components are thoroughly inspected at the factory. However, damage can occur in shipment. For this reason, the equipment should be thoroughly inspected upon arrival. Any damage noted should be reported immediately to the Transportation Company. This way, an authorized agent can examine the unit, determine the extent of damage and take necessary steps to rectify the claim with no serious or costly delays. At the same time, the local Vilter representative or the home office should be notified of any claim made.

All inquires should include the Vilter sales order number, compressor serial and model number. These can be found on the compressor name plate on the compressor.

All requests for information, services or parts should be directed to:

Vilter Manufacturing LLC
Customer Service Department
P.O. Box 8904
5555 South Packard Ave
Cudahy, WI 53110-8904 USA
Telephone: 1-414-744-0111
Fax:1-414-744-3483
e-mail: info.vilter@emerson.com

Equipment Identification Numbers:

Vilter Order Number: _____Compressor Serial Number: _____
Vilter Order Number: _____Compressor Serial Number: _____
Vilter Order Number: _____Compressor Serial Number: _____
Vilter Order Number: _____Compressor Serial Number: _____

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VSG STANDARD VILTER WARRANTY STATEMENT

Seller warrants all new single screw gas compression units and bareshaft single screw compressors manufactured by it and supplied to Buyer to be free from defects in materials and workmanship for a period of (a) eighteen (18) months from the date of shipment or (b) twelve (12) months from the date of installation at the end user's location, whichever occurs first.

If within such period any such product shall be proved to Seller's satisfaction to be defective, such product shall be repaired or replaced at Seller's option. Such repair or replacement shall be Seller's sole obligation and Buyer's exclusive remedy hereunder and shall be conditioned upon (a) Seller's receiving written notice of any alleged defect within ten (10) days after its discovery, (b) payment in full of all amounts owed by Buyer to Seller and (c) at Seller's option, Buyer shall have delivered such products to Seller, all expenses prepaid to its factory. Expenses incurred by Buyer in repairing or replacing any defective product (including, without limitation, labor, lost refrigerant or gas and freight costs) will not be allowed except by written permission of Seller. Further, Seller shall not be liable for any other direct, indirect, consequential, incidental, or special damages arising out of a breach of warranty.

This warranty is only applicable to products properly maintained and used according to Seller's instructions. This warranty does not apply (i) to ordinary wear and tear, damage caused by corrosion, misuse, overloading, neglect, improper use or operation (including, without limitation, operation beyond rated capacity), substitution of parts not approved by Seller, accident or alteration, as determined by Seller or (ii) if the product is operated on a gas with an H2S level above 100 PPM. In addition, Seller does not warrant that any equipment and features meet the requirements of any local, state or federal laws or regulations. Products supplied by Seller hereunder which are manufactured by someone else are not warranted by Seller in any way, but Seller agrees to assign to Buyer any warranty rights in such products that Seller may have from the original manufacturer. Labor and expenses for repair are not covered by warranty.

THE WARRANTY CONTAINED HEREIN IS EXCLUSIVE AND IN LIEU OF ALL OTHER REPRESENTATIONS AND WARRANTIES, EXPRESS OR IMPLIED, AND SELLER EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTY OF MERCHANTABILITY OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

Any description of the products, whether in writing or made orally by Seller or Seller's agents, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets or similar materials used in connection with Buyer's order are for the sole purpose of identifying the products and shall not be construed as an express warranty. Any suggestions by Seller or Seller's agents regarding use, application or suitability of the products shall not be construed as an express warranty unless confirmed to be such in writing by Seller.

Long Term Storage Requirements

The procedure described is a general recommendation for long term storage (over one month of no operation) of Vilter Manufacturing packages and compressors. While this procedure is intended to cover most of the commonly encountered situations, it is the responsibility of the installation firm and end user to address any unusual conditions. We suggest using the accompanying Long Term Storage Log sheet for recording purposes to validate the appropriate procedures.

Prior to start-up, Vilter recommends that a complete system pressure check be performed. Upon verification of the system integrity, a comprehensive evacuation procedure should be completed to ensure a dry system before gas is introduced. The oil circuit of any compressor is to be primed at initial start-up through the pre-lube oil pump on screw compressors.

Warranty of the system remains in effect as described in Section 5, Product Warranty and Procedures.

* If the unit is designed for indoor duty, it must be stored in a heated building.

  If the unit is designed for outdoor duty, and is to be stored outdoors, a canvas tarp is recommended for protection until installation is imminent. Adequate drainage should be provided, by placing wood blocks under the base skid, so that water does not collect inside the base perimeter or low spots in the tarp.

* All compressor stop valves are to be closed to isolate the compressor from the remainder of the system. All other valves, except those venting to atmosphere, are to be open. It is essential that the nitrogen holding charge integrity be maintained.

* Cover all bare metal surfaces (coupling, flange faces, etc.) with rust inhibitor.

* Desiccant is to be installed in the control panel. If the panel is equipped with a space heater, it is to be energized. If the panel does not have a space heater, use a thermostatically controlled 50-watt light bulb. Use an approved electrical spray-on corrosion inhibitor for panel components (relays, switches, etc.)

* All pneumatic controllers and valves (Fisher, Taylor, etc.) are to be covered with plastic bags and sealed with desiccant bags inside.

* System and compressor pressures (unit is shipped with dry nitrogen holding charge approximately 5 psi above atmospheric pressure) are to be monitored, on a regular basis, for leakage. It will be necessary to add a gauge to monitor the system holding charge pressure. If a drop in pressure occurs, the source of leakage must be found and corrected. The system must be evacuated and recharged with dry nitrogen to maintain the package integrity.

* Motors – (**NOTE:** The following are general recommendations. Consult the manufacturer of your motor for specific recommendations.)

1) Remove the condensation drain plugs from those units equipped with them and insert silica-gel into the openings. Insert one-half pound bags of silica-gel (or other desiccant material) into the air inlets and outlets of drip-proof type motors.

   NOTE: The bags must remain visible, and tagged, so they will be noticed and removed when the unit is prepared for service.

2) Cover the unit completely to exclude dirt, dust, moisture, and other foreign materials.

3) If the motor can be moved, it is suggested that the entire motor be encased in a strong, transparent plastic bag. Before sealing this bag, a moisture indicator should be attached to the side of the motor and several bags of silica-gel desiccant put inside the bag, around the motor. When the moisture indicator shows that the desiccant has lost its effectiveness, as by a change in color, the bag should be opened and fresh replacement desiccants installed.

   Whenever the motor cannot be sealed, space heaters must be installed to keep the motor at least 10°F above the ambient temperature.

   NOTE: There is a potential for damage by small rodents and other animals that will inhabit motors in search of warm surroundings or food. Due to this, a possibility of motor winding destruction exists. Sealing motor openings should restrict access to the motor.

4) Rotate motor and compressor shafts several revolutions (approximately 6) per month to eliminate flat spots on the bearing surfaces. If the compressor unit is installed, wired and charged with oil, open all oil line valves and run the oil pump for 10 seconds prior to rotating the compressor shaft. Continue running the oil pump while the compressor shaft is being turned to help lubricate the surfaces of the shaft seal.

Description

COMPRESSOR

The Vilter Single Screw Compressor is a positive displacement, capacity and volume controlled, oil flooded, rotary compressor which uses a single main screw intermeshed by two opposing gate rotors. Gas compression occurs when the individual fingers of each gate rotor sweep through the grooves, or flutes, of the main screw as the screw rotates. Compression occurs from the time the screw flute is first closed off by the gate rotor finger, until the time when the screw flute has rotated to the point of lining up with the discharge port in the compressor housing. A labyrinth type seal is used to prevent gas at discharge pressure from leaking past the end of the screw. Any discharge gas leakage past the labyrinth seal is vented back to suction via four longitudinal holes drilled through the body of the screw.

By venting the discharge end of the main screw back to suction, forces on each end of the screw are equal. This results in zero net axial forces on the main bearings. With twin opposing gate rotors, all radial forces are cancelled out also. Main shaft bearings have no net forces except the weight of the screw and the shaft assembly.

The compressors are comprised of three rotating assemblies: the main screw assembly and the two gate rotor assemblies. Each of these rotating assemblies use a common bearing configuration consisting of a single, cylindrical rolling element bearing at one end, and a pair of angular contact ball bearings at the other end. The pair of angular contact ball bearings are used to axially fix one end of the rotating shafts, and to absorb the small amount of thrust loads on the shafts. The inner races of the ball bearings are securely clamped to the rotating shafts, while the outer races are securely held in the bearing housing, thus fixing the axial position of the shaft in relation to the bearing housings. The cylindrical roller bearings at the opposite end of the shafts allow for axial growth of the shafts while supporting the radial loads from the shafts.

The suction gas enters the compressor housing through the top inlet flange, at the driven end of the unit. The driven end of the compressor housing is flooded with gas at suction pressure. The gas enters the open end of the main screw flutes at the driven end, and becomes trapped in the screw flute as the screw rotates and the gate rotor tooth enters the end of the flute. At this point, the compression process begins. Directly after the screw flute is closed off by the gate rotor tooth, oil is injected into the groove.

The oil enters the compressor through a connection at the top of the compressor. The purpose of the injected oil is to absorb the heat of compression, to seal the gate rotor tooth in the groove, and to lubricate the moving parts.

Additional internal oiling ports are provided at the main and gate rotor bearings to cool and lubricate the bearings. The mechanical shaft seal housing also contains oiling ports to lubricate, cool and provide a sealing film of oil for the mechanical shafts seal. Excess oil flows through the check valves on the sealing baffle plate. This oil is directed at the main rotor roller bearing, which cools and lubricates the front roller bearing.

As the main screw rotates, the gate rotor is also driven, causing the gate rotor tooth to sweep the groove in the main screw. This sweeping action reduces the volume of the groove ahead of the gate rotor tooth and causes the trapped gas and oil to be compressed in the reduced volume. As the main screw continues to rotate, the gate rotor tooth continues to reduce the groove volume to a minimum, thus compressing the trapped gas to a maximum pressure. A labyrinth seal arrangement prevents the compressed gas from leaking past the end of the screw. As the gate rotor tooth reaches the end of the groove, the groove rotates to a position that lines up with the discharge port in the compressor housing and the gas/oil mixture is discharged from the screw at high pressure. This completes the compression cycle for a single flute of the main screw.

Once the gas is swept from the main screw flute through the discharge port, it passes into the discharge manifold of the compressor. From the discharge manifold, the gas/oil exits the compressor housing

Description

The Vilter compressors feature the exclusive Parallex™ Slide System, which consists of a pair of slides for each gate rotor assembly. These two independently operated slides are referred to as the capacity slide and the volume ratio slide. On the suction end of the screw, the capacity slide moves to vary the timing of the beginning of the compression process. With the slide moved all the way out to the suction end of the screw (the 100% position), the compression process begins immediately after the gate rotor tooth enters the screw flute and closes off the end of the groove. In this situation, the maximum volume of gas is trapped in the screw flute at the start of the compression process. As the slide is pulled back away from the suction end of the screw, the start of the compression process is delayed as some of the suction gas is allowed to spill back out of the screw flute until the screw rotates far enough to pass the end of the capacity slide and begin compressing. This causes a reduced volume of gas to be trapped in the screw flute when the compression process begins. In this way, the capacity of the compressor is reduced from 100% down to as low as 10% of the full rated capacity.

The capacity slide provides the means for controlling specific process set points. By continuously adjusting the flow of gas through the compressor, either suction or discharge pressure in a particular process can be controlled. When coupled with a microprocessor controller, the adjustable capacity slide allows for precise and continuous automatic control of any parameter in the process to a chosen set point.

The second slide for each gate rotor is the volume ratio slide. The purpose of the volume ratio slide is to maximize the efficiency of the compressor by matching the gas pressure within the screw flute at the point of discharge to the downstream process requirements. The volume ratio slide operates at the discharge end of the screw, and acts to vary the position of the discharge port. When the slide is extended fully to the discharge end of the screw (the 100% position), the compression process within the screw flute continues until the screw rotates far enough for the flute to pass the end of the volume ratio slide. At this point, the screw flute lines up with the discharge port and the compressed gas is expelled from the screw flute. As the volume ratio slide is pulled back away from the discharge end of the screw, the position of the discharge port is changed and the gas is allowed to escape the screw flute earlier in the compression process, at a reduced pressure.
The overall volume ratio within the compressor is determined by the distance between the front of the capacity slide (the start of compression) and the back of the volume ratio slide (the completion of compression). Therefore, the volume ratio slide must respond to changes in the downstream pressure measured in the oil separator and position itself for the required compression ratio based on the position of the capacity slide. By only compressing the gas within the screw as far as required to match the pressure in the downstream receiver, the compressor efficiency is maximized. Proper positioning of the volume ratio slide prevents either over compressing or under compressing of the gas within the screw flute. This allows the single screw compressor to efficiently handle a range of volume ratios from as low as 1.2 up to 7.0.

Foundation

- The foundation must adequately support the weight of the compressor package, including vessels, oil coolers, controllers, and all ancillary equipment. (See documentation for weight and dimension specifications
- A detailed general arrangement drawing is provided with all packages. This drawing details foundation type, mounting foot locations, grouting, and anchoring methods for the specific package.
- Vilter Mfg. recommends consulting a licensed architect to design a suitable foundation for the application.
- Foundations must be built of industrial-grade materials and conform to the appropriate building codes.
- Mount the unit in a location which allows adequate clearance around the unit for maintenance.
- The unit may be top-heavy so caution should be taken when lifting and moving the unit; See the "Rigging and Lifting" documentation provided with the unit.
- The unit must be securely bolted to the foundation and shims should be used to level the unit for proper operation. Grouting must be used.
- The compressor should be firmly mounted to the package; isolation dampers should not be used between the compressor and the package frame.
- Pipes and conduits are strictly "no step" areas and could be damaged if used as foot or handholds.
- Adequately support pipes, conduits, etc. to prevent both transmission of vibration and failure due to stress at the flanges. Suction and discharge lines must be supported with appropriate pipe hangers to prevent their movement if they are disconnected from the compressor package. (See Table 1 below for Unit Weights.)
- In high-pressure screw compressor applications, package vibration and noise levels may be higher than those found in standard refrigeration applications. In these cases, adequate foundation and proper installation are vital to ensure trouble-free operation. Additional sound attenuation measures may also be needed.

TABLE 1. UNIT WEIGHTS

MODEL	STANDARD UNIT (LBS)*
VSG 301	2,650
VSG 361	2,750
VSG 401	2,850
VSG 501	4,000
VSG 601	4,500
VSG 701	5,000
VSSG 291	4,300
VSSG 341	4,400
VSSG 451	4,500
VSSG 601	4,600
VSG 751	5,300
VSG 901	5,400
VSG 1051	6,600
VSG 1201	6,700
VSG 1551	10,000
VSG 1851	10,100
VSG 2101	10,200

* Does not include motor.

Rigging and Lifting

Thank you for purchasing a gas compressor (the "Compressor") from Vilter Manufacturing LLC ("Vilter"). Rigging and Lifting a large piece of equipment like the Compressor is extremely dangerous.

DISCLAIMER

Notice

This rigging and lifting manual (this "Manual") is provided to you as a courtesy by Vilter and is not intended to be a comprehensive guide to rigging and lifting the Compressor. Vilter shall not be liable for errors contained herein or for incidental or consequential damages (including any injury to persons performing the rigging or lifting) in connection with the furnishing, performance, or use of this Manual. This Manual is only a set of suggestions and you may not rely solely on the information contained in this Manual to conduct the lift. In addition, information in this Manual is subject to change without notice.

Limited Warranty

The information is this Manual does not constitute any warranty as to the Compressor. The warranty provision contained in the terms and conditions pursuant to which the Compressor was sold serves as the sole and exclusive warranty.

Safety

To correctly and safely operate the Compressor, you must consult all of the documentation that was provided to you with the purchase of the Compressor (including all information sheets, warning notices and any other documents). This Manual is not intended to summarize or supplant any directions regarding how to safely operate or move the Compressor.

BEFORE LIFTING AND RIGGING THE COMPRESSOR

In order to minimize the inherent risk involved in rigging and lifting a large piece of equipment, before attempting to lift the Compressor, the actions of all parties involved in the lift must be carefully planned.

The following is provided merely to encourage purchasers to think about all of the steps necessary to rig and lift the Compressor. Vilter can neither anticipate all of the dangers involved in a particular lift, nor evaluate the particular capabilities of each of person who will participate in the lift.

Educate and Select Lift Participants

To rig and lift the Compressor in a safe manner, you will need to select experienced, trained people ("Participants") to take on (and successfully perform) at a minimum the tasks associated with each of the following positions:

- Crane Operator;
- Crane Owner;
- Lift Coordinator;
- Lift Engineer;
- Rigging Specialist;
- Riggers; and
- Safety Signaler.

Training curriculum for Participants, at a minimum, should include:

- A review of safe operating practices;
- A review of who each person is and their specific role in the lift;
- A tutorial on how to read lift charts;
- A demonstration on how to use and inspect rigging hardware;
- A review of the company's general lift plans and procedures;
- A tutorial on hand signals normally used to communicate with crane operators (a copy of such hand signals may be obtained from machine safety vendors); and
- A review of the Compressor's specific rig and lift plan (the "Plan") (developed by the Lift Coordinator and Lift Engineer); please see the section immediately below entitled "Create and Communicate the Plan."

Individuals participating in the lift should fully understand the scientific principles pursuant to which a successful lift is dependent—for example, center of gravity, equilibrium, and mechanics of load stabilization, critical angle considerations and force.

All Participants should undergo a fitness-for-duty program, including drug testing and medical examinations.

Create and Communicate the Plan

Well in advance of the planned lift date, lift planning meetings and hazard assessment meetings should be held with all Participants in attendance. In addition, the Plan should be finalized and distributed for review and comment.

The Plan should clearly define requirements, expectations and specifications for lifting the Compressor. At a minimum, the Plan should include:

- Standard lifting and rigging procedures in place at the lift site (including proper classification of the lift as a "critical lift" a "serious lift" or a "standard lift");
- Drawings of the Compressor;
- A description of the lifting task;
- An evaluation of the hazards;
- The rigging plan and sketches of rigging to be attached to the Compressor;
- The roles and responsibilities of all Participants;
- An emergency plan; and
- The contact information of the Plan preparer

It is important to confirm that each Participant understands both the broader Plan and their specific responsibilities during the lift. Participants should be encouraged to contact the Plan preparer at any time if they have questions. In addition, the Plan preparer should be on-site during the lift to ensure that the lift is being executed in accordance with the Plan. Finally, well in advance of the lift date, it should be confirmed that all necessary permits have been obtained.

Inspect and Use the Appropriate Lifting Equipment

Verify Crane Operator and Crane Owner Credentials

Prior to rigging and lifting the Compressor, certain precautions should be taken with regards to the crane, the crane operator and the crane owner.

- The lift capacity of the crane must exceed the Compressor's weight;
- Confirm that the crane operator is qualified to work on the site;

- Get third-party confirmation that the crane owner and the crane operator are in compliance with applicable laws, regulations and internal safety standards;
- Consult with the crane owner to determine if any site preparation is required for outriggers—improper use of outriggers is a significant cause of crane failure;
- Determine the level of supervision to be supplied by the crane owner; and
- Review all crane maintenance and inspection records, including without limitation, the crane log book, maintenance records, inspection reports and the physical condition of the crane.

Take all Appropriate Measurements
- Understand and interpret the load charts;
- Review all Compressor drawings for unit size, weight, center of gravity and other specifications;
- Communicate incident response procedures in writing prior to the lift and verbally immediately before the lift;
- Determine the initial position, final position, orientation and elevation of the Compressor;
- Ensure that adequate space is provided to safely assemble, erect, and operate the crane and materials (such as timber mats, cribbing and blocks);
- Identify and communicate to all Participants the access points, lift radius, swing radius, clearances, and obstructions;
- Eliminate hazards and obstructions that may interfere with moving the Compressor; and
- Inform all Participants of water lines, sewer lines, power lines and other obstructions.

Use Proper Rigging Methods
- Determine diameter, length and quantity of necessary rigging hardware (design and detail the rigging hardware to suit lifting the Compressor at the supplied pad eyes);
- Review and inspect all hoisting, lifting and rigging equipment;
- Select shackle size and prepare sketches or drawings for rigging;
- Use proper, conservative rigging techniques—including spreader beams—needed to lift the Compressor;
- Pad sharp corners, check the orientation of chocker hitches and the orientation of hooks;
- Prevent the binding of hoist rings; and
- Verify pad eye information.

TEST AND BALANCE THE COMPRESSOR

It is essential to test and balance the compressor before executing the actual lift in order to identify potential causes of injury to Participants and the Compressor.

Secure Rigging and the Lift Site
- Reiterate that no one should walk under the raised load;
- Secure and restrict access to the lift area (consider vacating all non-essential personnel from the area);
- Provide qualified supervision for the duration of the lift;
- If applicable, assess the weather conditions and decide if it is safe to proceed;
- Stop the lift when any potentially unsafe conditions are recognized; and
- Ensure there are open channels for communications during the pre-lift, lift and post-lift phases (radio communications should be used if a direct line of sight is not possible).

Test and Balance the Compressor before the Lift
- Slowly raise the crane to take slack out of the rigging without actually lifting the load;
- Allow the rigging gear to settle into place;
- Check for twists and binds;
- Verify that all padding has remained in place and that all slings are protected from sharp edges;
- Begin to raise the load to verify balance and check the braking system; and

- If the Compressor is not balanced, lower and adjust as necessary.

CONTACT VILTER

While Vilter will not offer any specific feedback on the Plan or provide a specific Plan for rigging and lifting the Compressor, Vilter may be able to answer questions about the Compressor that are important in developing your Plan.

Please contact Vilter at:

P.O. Box 8904
5555 S Packard Ave
Cudahy, WI 53110-8904

Telephone: 1-414-744-0111
Fax: 1-414-744-3483

email: info.vilter@emerson.com

www.vilter.com

Installation

DELIVERY INSPECTION

Vilter screw compressor components are thoroughly inspected at the factory. However, damage can occur in shipment. For this reason, the units should be thoroughly inspected upon arrival. Any damage noted should be reported immediately to the transportation company. This way, an authorized agent can examine the unit, determine the extent of damage and take necessary steps to rectify the claim with no serious or costly delays. At the same time, the local Vilter representative or the home office should be notified of any claim made.

LOCATING UNIT - DRIVE COUPLING ALIGNMENT

The single screw compressor units are shipped with all major components mounted on structural steel. Place the entire unit on the floor on a concrete pad and securely bolt in place. Grouting is required. Review local codes and ASHRAE Safety Code for Mechanical. Bolt holes are located in the unit's mounting feet. When locating the unit, provide adequate space for service work. When the compressor unit is in place on the concrete pad, check both lengthwise and crosswise to assure it is level. Use shims and wedges as needed under the mounting feet to adjust the level of the unit.

On single screw units, the motor and compressor have been roughly aligned at the factory. The coupling center section was shipped loose to allow a check of proper electrical phasing, direction of rotation of the motor and final coupling alignment. The dial indicator alignment method is recommended. Final alignment should be within 0.002 inches total indicator reading in all directions for both the VSG and VSSG models.

SYSTEM PIPING

Hangers and supports for the Suction, Discharge, Oil Lines & Water Lines, should receive careful attention. The Hangers or Supports "MUST" have ample strength and be securely anchored to handle the full support of the piping connecting to the Vilter Single Screw Unit. The piping support should be designed so that the weight of any interconnecting piping is not put onto the Compressor Unit.

ELECTRICAL CONNECTIONS

See the Compact Logix PLC manual. (p/n 35391CL)

TESTING SYSTEM FOR LEAKS

Vilter equipment is tested for leaks at the factory. One the most important steps in putting a system into operation is field testing for leaks. This must be done to assure a tight system. To test leaks, the system pressure must be built up. Before testing may proceed, several things must be done.

First, if test pressures exceed the settings of the system, relief valves or safety devices, they must be removed and the connection plugged during the test. Secondly, all valves should be opened except those leading to the atmosphere. Then, open all solenoids and pressure regulators by the manual lifting stems. All bypass arrangements must also be opened.

NOTE:
Do not hydro-test the SS unit. This can cause damage to the the filter elements.

UNIT OIL CHARGING

The compressor unit is shipped from Vilter with no oil charge. The initial oil charge can be made through the drain valve at the oil separator. Vilter motor driven and manually operated oil chargers are available for this purpose.

The normal operating level is the middle of the UPPER sight glass on the oil separator. See Table 2 for approximate separator oil charge requirements.

TABLE 2. OIL CHARGE

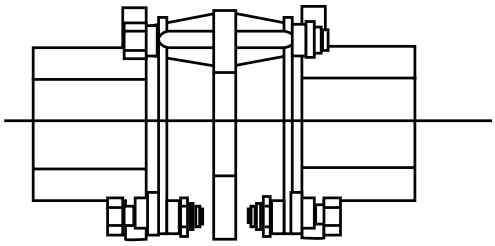
Oil Sep Size	Approximate Oil Charge – Gal.
16”	20 to 27
20”	22 to 31
20”	20 to 25
30”	30 to 35
20”	30 to 40
24”	40 to 50
30”	60 to 75
36”	95 to 105
42”	145 to 165

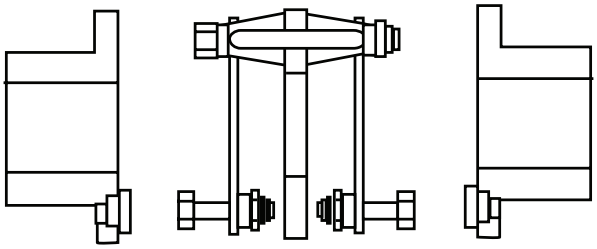
The oil level may be above the top sight glass at this time. Electrically forcing on the oil pump will aid in pre-lubing the various oil lines,oil filter, and other items in the oil circuit before starting the unit. Add oil as required to bring the level back up the middle of UPPER sight glass before stating the unit. Do not mix oils.

Oil For Single Screw Compressors

Due to the need for adequate lubrication, Vilter recommends only the use of Vilter lubricants, designed specifically for Vilter compressors. With the extensive research that has been performed, we are able to offer gas compression lubricating oils. Use of oil not specified or supplied by Vilter will void the compressor warranty.

Please contact your local Vilter representative or the Home Office for further information.





COUPLING INFORMATION

All other coupling information can be found in the vendor section of this manual.

COUPLINGS INSTALLATION AND ALIGNMENT

These instructions are intended to help you to install and align the coupling. Covered here will be general information, hub mounting, alignment, assembly, locknut torquing, discpack replacement, and part numbers. The coupling as received, may or may not be assembled.
*If assembled, the locknuts are not torqued.
*If coupling is assembled, remove the bolts that attach the hubs to the disc packs. Remove both hubs. Leave the disc packs attached to the center member.

A. Hub Mounting:

1. Clean hub bores and shafts. Remove any nicks or burrs. If bore is tapered, check for good contact pattern. If the bore is straight, measure the bore and shaft diameters to assure proper fit. The key(s) should have a snug side-to-side fit with a small clearance over the top.

NOTE: If the hub position on the shaft does not allow enough room to install the short bolts in the hub after hub mounting, install the bolts and disc pack before mounting hub on shaft.

B. Straight Bore:

1. Install key(s) in the shaft. If the hub is an interference fit, heat the hub in an oil bath or oven until bore is sufficiently larger than the shaft. 350º F. is usually sufficient. An open flame is not recommended. However, if flame heating is necessary, use a very large rose bud tip to give even heat distribution. A thermal heat stick will help determine hub temperature. **DO NOT SPOT HEAT THE HUB OR DISTORTION MAY OCCUR.** With the hubs expanded, slide it up the shaft to the desired axial position. A pre-set axial stop device can be helpful.

C. Taper Bore:

1. Put the hub on the shaft without key(s) in place. Lightly tap hub up the shaft with a soft hammer. This will assure a metal-to-metal fit between shaft and hub. This is the starting point for the axial draw. Record this position between shaft and hub face with a depth micrometer. Mount a dial indicator to read axial hub movement. Set the indicator to "0". Remove hub and install key(s). Remount hub, drawing it up the shaft to the "0" set point. Continue to advance hub up the taper to the desired axial position. Use the indicator as a guide only. A pre-set axial stop device can be helpful. Check the final results with a depth micrometer. The hub may have to be heated in order to reach the desired position on the shaft. **DO NOT SPOT HEAT THE HUB OR DISTORTION MAY OCCUR.** Install shaft locknut to hold hub in place.

D. Shaft Alignment.

Move equipment into place.

1. *Soft Foot*. The equipment must sit flat on its base (+/- 0.002 inches). Any soft foot must be corrected now.

2. *Axial Spacing*. The axial spacing of the shafts should be positioned so that the disc packs (flexing elements) are flat when the equipment is running under normal operating conditions.

This means there is a minimal amount of waviness in the disc pack when viewed from the side. This will result in a flexing element that is centered and parallel to its mating flange faces. Move the connected equipment to accomplish the above.

NOTE: The disc pack is designed to an optimal thickness and is not to be used for axial adjustments.

See documentation that came with the coupling for complete specifications.

3. *Angular Alignment*. Rigidly mount a dial indicator on one hub or shaft, reading the face of the other hub flange, as shown on next page. Rotate both shafts together, making sure the shaft axial spacing remains constant. Adjust the equipment by shimming and/or moving so that the indicator reading is within .002 inch per inch of coupling flange.

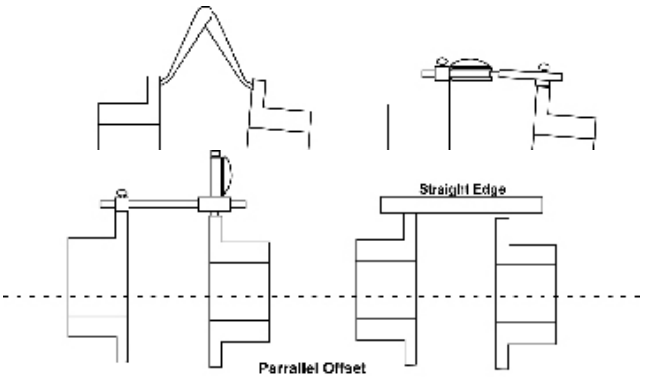
4. *Parallel Offse*t. Rigidly mount a dial indicator on one hub or shaft, reading the other hub flange outside diameter, as shown in Figure 3. Indicator set-up sag must be compensated for. Rotate both shafts together. Adjust the equipment by shimming and/or moving so that the indicator reading is within .002 inch per inch of the axial length between flex elements. See drawing below.

Note: If the driver or driven equipment alignment specification is tighter than these recommendations, the specification should be used. Also, be sure to compensate for thermal movement in the equipment. The coupling is capable of approximately four time the above shaft alignment tolerances. However, close alignment at installation will provide longer service with smoother operation.

E. Final assembly

With the coupling in good alignment the bolts will fit through the holes in the flanges and the disc packs more easily.

Note: Alignment of C-Flange Units should be checked when compressor or motor are replaced.



1. If the coupling arrived assembled, the disc packs are still attached to the center ring. Before taking the discs packs off, first install one hub bolt through each disc pack and secure with lock out. This will help when the pack is reinstalled late. If the coupling was shipped disassembled, the bolt through the pack is not required as the discs in the pack are factory taped together.

2. Remove the long bolts. Mount the disc packs on the hubs with one bolt through the disc pack aligned with a clearance hole in the hub. Install the short bolts through the hub, disc pack, bevel washer or link, and secure with a lockout.

3. Remove the long bolts. Mount the disc packs on the hubs with one bolt through the disc pack aligned with a clearance hole in the hub. Install the short bolts through the hub, disc pack, bevel washer or link, and secure with a lockout.

NOTE: All bolt threads should be lubricated. A clean motor oil is recommended. On size 226 and larger, a link must be put on bolt first. Remove the disc pack alignment bolt. Proceed to mount the second disc pack to the other hub in the same way.

4. Position one set of short bolts in each hub on top. Now slide the center ring down into place straddling the short bolts with the center ring bushings. If coupling is dynamically balanced, the center ring match marks must lineup with both hub match marks. When one bushing is in-line

with the hole in the disc pack, slide one long bolt through washer or link, disc pack, center ring, disc pack, washer or link, and then secure with a locknut. The long bolt requires a minimum clearance "R" for installation between back side of coupling flange and stationary equipment. See Figure 1 and Table l for value of "R." On size 226 and larger a link must be put on the bolt first. Now install the rest of the long bolts in the same manner.

5. Torque the long bolt locknuts at this time.

NOTE: With the coupling in good alignment, the bolts will fit through the holes in the flanges and the disc pack more easily. It is recommended that all locknuts be retightened after several hours of initial operation.
E. For further help with the installation or alignment, consult Rexnord.

F. Disc Pack Replacement.

If it becomes necessary to replace the disc pack, it can be done as follows:

1. Remove all the long bolts and lower the center ring by sliding it our from between the two disc packs.

2. Remove one short bolt from the disc pack/hub connection and reinstall it through a hub clearance hole and into the hole in the disc pack. Put the nut on. This will keep the discs together and maintains the disc orientation for later reinstallation. Remove the rest of the short bolts and takeoff the disc pack. Repeat for the second disc pack.

3. Replace the pack(s) if required. Recheck alignment per Section D. Reassemble per Section E.

Slide Valve Actuator Installations Instructions

Caution

WHEN INSTALLING THE OPTICAL SLIDE MOTOR, LOOSEN LOCKING COLLAR BEFORE SLIDING THE COLLAR DOWN ON THE SHAFT. DO NOT USE A SCREWDRIVER TO PRY LOCKING COLLAR INTO POSITION.

OVERVIEW

Calibration of an optical slide valve actuator is a two step process that must be done for each actuator installed of the compressor. Briefly, the steps are as follows.

1) The actuator motor control module, located inside the actuator housing, is calibrated so that it knows the minimum and maximum rotational positions of the slide valve it controls. The calibrated actuator will output 0 VDC at the minimum position and 5 VDC at the maximum position.

2) After the actuator motor control module has been calibrated for 0-5Volts, the controlling channel corresponding to the actuator motor (either the capacity or volume) has to be calibrated. This instructs the control panel to learn the rotational 0% position & rotational 100% position of the slide valve travel.

PLEASE NOTE:
Because there is an optical sensor on this motor, do not attempt calibration in direct sunlight.

ACTUATOR MOTOR CONTROL MODULE CALIBRATION PROCEDURE

1. Disable the Slide Non-Movement Alarm by going to the "Setup" menu on the control panel and choosing "Alarm Disable" for the Slide Non-Movement Option. (If applicable).

2. Completely shut off the power to the control panel completely.

3. If not already done, mount the slide valve actuator per ("Vilter Actuator set up for Capacity and Volume Slide Motors). Next, wire the actuator per the attached wiring diagrams, using the already installed electrical conduit to run the cables. The old wiring can be used to pull the new cables through the conduit to the control panel. The cables may also be externally tie-wrapped to the conduit**. Run the yellow AC power cable(s) and the gray DC position transmitter cable(s) in different conduit.** This prevents the DC position transmitter cable from picking up electrical noise from the AC power cable. **Do not connect either of the cables to the actuators yet.**

In addition, if the actuators are replacing old gearmotors on early units, **you must remove the capacitors and associated wiring from inside the control panel.** This is necessary to prevent electrical damage to the new actuator motor.

4. When completing the calibration of the new actuators, the motors are signaled to move to below 5%. This may not completely occur when exiting the calibration screen due to a "program timer". HOWEVER, when the compressor actually starts, the motors will travel below 5% and function correctly. The user may see that the actuators are not below 5% after calibration and try to find the reason. If the calibration screen is re-entered right away and then exited, the timer will allow the actuator to go below the 5% on the screen. This may be perceived as a problem; in reality,it is not.

5. Note:The 0 to 5V-position transmitter output of the actuator will fluctuate wildly during the calibration process. To prevent damage to the actuators, do not connect the yellow power cable or the gray position transmitter cable until instructed to do so later on.

6. Open the plastic cover of the capacity motor by removing the four #10 screws.

Caution: there are wires attached to the connector on the plastic cover. Handling the cover too aggressively could break the wires.

7. Gently lift the cover and tilt it toward the Turck connectors. Raise the cover enough to be able to press the blue calibrate button and be able to see the red LED on the top of assembly.

8. Press "Menu" on the main screen and then press the "Slide Calibration" button, to enter the slide calibration screen. (Note: you must be in this slide calibration screen before attaching the yellow power cable or gray position transmitter cable.)

9. Now connect the yellow power cable and the gray position transmitter cable to the actuator.

10. Press INC and DEC to move the slide valve and check for the correct rotation. See Table 1 on page 48 for Actuator/command shaft rotation specifications.

11. Note: If the increase and decrease buttons do not correspond to increase or decrease shaft rotation, swap the blue and brown wires of the "yellow power cable". This will reverse the rotation of the actuator/command shaft.

12. Quickly press and release the blue push button on the actuator one time. This places the actuator in calibration mode. The red LED will begin flashing rapidly.

13. Note: When the actuator is in calibration mode, it outputs 0V when the actuator is running and 5V when it is still. Thus, as stated earlier, the actuator voltage will fluctuate during calibration. After the actuator has been calibrated, 0V output will correspond to the minimum position and 5V to the maximum position.

14. Note: The "Slide calibration" screen on the control panel has a "Current" window, which displays twice the actuator output voltage. This value, (the % volume and the % capacity) displayed in the "Current Vol" and Current Cap" Windows are meaningless until calibration has been completed.

15. Use the DEC button on the control panel to drive the slide valve to its minimum "mechanical stop" position. **Do not continue to run the actuator in this direction after the slide valve has reached the stop. Doing so may cause damage to the actuator or the slide valve.** When the slide has reached the mechanical stop position, use the INC button to pulse the actuator to where the slide is just off of the mechanical stop and there is no tension on the motor shaft.

16. Quickly press and release the blue button on the actuator again. The red LED will now flash at a slower rate, indication that the minimum slide valve position (0V position) has been set.

17. Use the INC button on the control panel to drive the slide to its maximum "mechanical stop" position. **Do not continue to run the actuator in this direction after the slide valve has reached the stop. Doing so may cause damage to the actuator or the slide valve.** When the slide valve has reached the mechanical stop position, use the DEC button to pulse the actuator to where the slide is just off of its mechanical stop and there is no tension on the motor shaft.

18. Quickly press and release the blue button on the actuator one more time. The red LED will stop flashing. The actuator is now calibrated and knows the minimum and maximum positions of the slide valve it controls. Now the capacity or volume channel of the control panel can be calibrated.

19. Use the Dec button to move the actuator towards its minimum position while watching the millivolt readout on the control panel screen. Discontinue pressing the DEC button when the millivolt reading in the "Current" window above the "Set Min" button is approximately 500 millivolts.

20. Now use the DEC and INC buttons to position the slide valve until a value close to 300 millivolts is on the screen. Then, press the "Set Min" button for the capacity or volume slide valve window to tell the controller that this is the minimum millivolt position. Note: The value in the "Current Cap" or "Current Vol" window has no meaning right now.

21. Use the INC button to rotate the actuator towards its maximum position while watching the millivolt readout on the controller screen. Discontinue pressing the INC button when the millivolt reading in the "Current" window is approximately 9200 millivolts (7900 millivolts for the 2783J qualified analog boards). You are nearing the mechanical stop position.

22. Pulse the INC button to carefully move the slide valve until the millivolt readout "saturates", or stops increasing. This is around 9500 millivolts (8400 millivolts for 2783 qualified analog boards).

23. Pulse the DEC button until the millivolts just start to decrease. (This is the point where the channel drops out of saturation).Adjust millivolt value to 300 millivolts below recorded maximum millivolts in step #22.

24. Press the "Set Max" button.

25. Press the "Main" button to complete calibration and exit the "Slide Calibration" screen. The controller will automatically energize the actuator and drive it back to its minimum position (below 5%) for pre-start-up.

26. Note: Now the "Current Cap" or the "Current Vol" value will be displayed in the window on the "Main" screen and the "Slide Calibration" screen.

27. Gently lower the plastic cover over the top of the actuator to where it contacts the base and o-ring seal. After making sure the cover is seated properly, gently tighten the four #10 screws. **Caution: The plastic cover will crack if the screws are over tightened.**

28. Enable the "Slide Non-Movement Alarm" by going to the "Setup" menu and choosing "Alarm Enable" for the "Slide Non-Movement Option".

29. This completes the calibration for this channel either capacity or volume. Repeat the same procedure to the other channel.

Slide Valve Operation

Slide Valve Actuator Operation

The slide valve actuator is a gear-motor with a position sensor. The motor is powered in the forward and reverse directions from the main computer in the control panel. The position sensor tells the main computer the position of the slide valve. The main computer uses the position and process information to decide where to move the slide valve next.

The position sensors works by optically counting motor turns. On the shaft of the motor is a small aluminum "photochopper". It has a 180 degree fence that passes through the slots of two slotted optocouplers. The optocouplers have an infrared light emitting diode (LED) on one side of the slot and a phototransistor on the other. The phototransistor behaves as a light controlled switch. When the photochopper fence is blocking the slot, light from the LED is prevented from reaching the phototransistor and the switch is open. When photochopper fence is not blocking the slot, the switch is closed.

As the motor turns, the photochopper fence alternately blocks and opens the optocoupler slots, generating a sequence that the position sensor microcontroller can use to determine motor position by counting. Because the motor is connected to the slide valve by gears, knowing the motor position means knowing the slide valve position.

During calibration, the position sensor records the high and low count of motor turns. The operator tells the position sensor when the actuator is at the high or low position with the push button. Refer to the calibration instructions for the detailed calibration procedure.

The position sensor can get "lost" if the motor is moved while the position sensor is not powered. To prevent this, the motor can only be moved electrically while the position sensor is powered. When the position sensor loses power, power is cut to the motor. A capacitor stores enough energy to keep the position sensor circuitry alive long enough for the motor to come to a complete stop and then save the motor position to non-volatile EEPROM memory. When power is restored, the saved motor position is read from EEPROM memory and the actuators resumes normal function

This scheme is not foolproof. If the motor is moved manually while the power is off or the motor brake has failed, allowing the motor to free wheel for too long after the position sensor looses power, the actuator will become lost.

A brake failure can sometimes be detected by the position sensor. If the motor never stops turning after a power loss, the position sensor detects this, knows it will be lost, and goes immediately into calibrate mode when power is restored.

Slide Valve Actuator Trouble Shooting Guide

Problem	Reason	Solution
The actuator cannot be calibrated	Dirt or debris is blocking one or both optocoupler slots	Clean the optocoupler slots with a Q-Tip and rubbing alcohol.
	The photochopper fence extends less than about half way into the optocoupler slots	Adjust the photochopper so that the fence extends further into the optocoupler slots. Make sure the motor brake operates freely and the photochopper will not contact the optocouplers when the shaft is pressed down.
	The white calibrate wire in the grey Turck cable is grounded	Tape the end of the white wire in the panel and make sure that it cannot touch metal
	Dirt and/or condensation on the position sensor boards are causing it to malfunction	Clean the boards with an electronics cleaner or compressed air.
	The calibrate button is stuck down	Try to free the stuck button.
	The position sensor has failed	Replace the actuator.
	Push button is being held down for more that ¾ second when going through the calibration procedure	Depress the button quickly and then let go. Each ¾ second the button is held down counts as another press.
The actuator goes into calibration mode spontaneously	The white calibrate wire in the grey Turck cable is grounding intermittently	Tape the end of the white wire in the panel and make sure that it cannot touch metal.
	A very strong source of electromagnetic interference (EMI), such as a contactor, is in the vicinity of the actuator or grey cable	Increase the distance between the EMI source and the actuator. Install additional metal shielding material between the EMI source and the actuator or cable.
	There is an intermittent failure of the position sensor	Replace the actuator.
The actuator goes into calibration mode every time power is restored after a power loss	The motor brake is not working properly (see theory section above.)	Get the motor brake to where it operates freely and recalibrate.

Slide Valve Actuator Trouble Shooting Guide

Problem	Reason	Solution
The actuator does not transmit the correct position after a power loss	The motor was manually moved while the position sensor was not powered.	Recalibrate.
	The motor brake is not working properly	Get the motor brake to where it operates freely and then recalibrate.
	The position sensor's EEPROM memory has failed	Replace the actuator.
There is a rapid clicking noise when the motor is operating	The photochopper is misaligned with the slotted optocouplers	Try to realign or replace the actuator.
	The photochopper is positioned too low on the motor shaft.	Adjust the photochopper so that the fence extends further into the optocoupler slots.
	A motor bearing has failed	Replace the actuator.
The motor operates in one direction only	There is a loose connection in the screw terminal blocks	Tighten.
	There is a loose or dirty connection in the yellow Turck cable	Clean and tighten.
	The position sensor has failed	Replace the actuator.
	There is a broken motor lead or winding	Replace the actuator.
The motor will not move in either direction	The thermal switch has tripped because the motor is overheated	The motor will resume operation when it cools. This could be caused by a malfunctioning control panel. Consult the factory.
	Any of the reasons listed in "The motor operates in one direction only"	See above.
	The command shaft is jammed	Free the command shaft.
	Broken gears in the gearmotor	Replace the actuator.
The motor runs intermittently, several minutes on, several minutes off	Motor is overheating and the thermal switch is tripping	This could be caused by a malfunctioning control panel. Consult the factory.

Slide Valve Actuator Trouble Shooting Guide

Problem	Reason	Solution
The motor runs sporadically	Bad thermal switch	Replace the actuator.
	Any of the reasons listed in "The motor will not move in either direction"	See above.
The motor runs but output shaft will not turn	Stripped gears inside the gear motor or the armature has come unpressed from the armature shaft	Replace the actuator.

Slide Valve Actuators communicate problems discovered by internal diagnostics via LED blink codes. Only one blink code is displayed, even though it is possible that more than one problem has been detected.

Flash Pattern	Meaning
*=ON _=OFF	
*_*_*_*_*_*_*_*_*_*_*_*_*_	Calibration step 1
*___*___*___*___*___*___	Calibration step 2
*__*_____	This indicates a zero span. This error can only occur during calibration. The typical cause is forgetting to move the actuator when setting the upper limit of the span. If this is the case, press the blue button to restart the calibration procedure. This error can also occur if either or both of the slotted optocouplers are not working. If this is the case, the slide valve actuator will have to be replaced. The operation of the slotted optocouplers is tested as follows: 1. Manually rotate the motor shaft until the aluminum photochopper fence is not blocking either of the optocoupler slots. 2. Using a digital multi-meter, measure the DC voltage between terminal 3 of the small terminal block and TP1 on the circuit board (see Note 1). You should measure between 0.1 and 0.2 Volts. 3. Next, measure the DC voltage between terminal 3 and TP2 on the circuit board. You should measure between 0.1 and 0.2 Volts.

Slide Valve Actuator Trouble Shooting Guide

*_____	This indicates a skipped state in the patterns generated by the optocouplers as the motor moves. This error means that the slide valve actuator is no longer transmitting accurate position information. The actuator should be recalibrated as soon as possible. This code will not clear until the actuator is recalibrated. This code can be caused by: 1. The motor speed exceeding the position sensors ability to measure it at some time during operation. A non-functioning motor brake is usually to blame. 2. The actuator is being operated where strong infrared light can falsely trigger the slotted optocouplers, such as direct sunlight. Shade the actuator when the cover is off for service and calibration. Do not operate the actuator with the cover off.
*__*__*_____	The motor has overheated. The actuator motor will not run until it cools. Once the motor cools, the actuator will resume normal operation. Motor overheating is sometimes a problem in hot and humid environments when process conditions demand that the slide valve reposition often. Solutions are available; consult your Vilter authorized distributor for details. Another possible cause for this error is a stuck motor thermal switch. The thermal switch can be tested by measuring the DC voltage with a digital multi-meter between the two TS1 wire pads (see Note 2). If the switch is closed (normal operation) you will measure 0 Volts.
**********	The 24V supply is voltage is low. This will occur momentarily when the actuator is powered up and on power down. If the problem persists, measure the voltage using a digital multi-meter between terminals 3 and 4 of the small terminal block. If the voltage is >= 24V, replace the actuator.
_**********	The EEPROM data is bad. This is usually caused by loss of 24V power before the calibration procedure was completed. The actuator will not move while this error code is displayed. To clear the error, calibrate the actuator. If this error has occurred and the cause was not the loss of 24V power during calibration, possible causes are: 1. The EEPROM memory in the micro-controller is bad. 2. The large blue capacitor is bad or has a cracked lead.
*****____*_____	Micro-controller program failure. Replace the actuator.

Note 1: TP1 and TP2 are plated-thru holes located close to the slotted optocouplers on the board. They are clearly marked on the board silkscreen legend.

Note 2: The TS1 wire pads are where the motor thermal switch leads solder into the circuit board. They are clearly marked on the board silkscreen legend and are oriented at a 45 degree angle.

Notice on using Non -Vilter Oils

Oil and its additives are crucial in system performance. Vilter Manufacturing will **NOT APPROVE** non-Vilter oils for use with Vilter compressors. Due to the innumerable choices available it is not possible for us to test all oils offered in the market place, and their effects on our equipment.

We realize that customers may choose lubricants other than Vilter branded oil. This is certainly within the customers' right as owners of the equipment. When this choice is made, however, Vilter is unable to accept responsibility for any detrimental affects those lubricants may have on the equipment or system performance and durability.

Should a lubrication related system issue occur with the use of non-Vilter oils, Vilter may deny warranty upon evaluation of the issue. This includes any parts' failure caused by inadequate lubrication.

Certainly, there are many good lubricants in the market place. The choice of a lubricant for a particular application involves consideration of many aspects of the lubricant and how it and its additive package will react in the various parts of the entire system. It is a complex choice that depends on a combination of field experience, lab and field-testing, and knowledge of lubricant chosen. Vilter will not accept those risks other than for our own lubricants.

OIL SYSTEM

A. Oil Charge

Charge the oil separator with the proper quantity of lubricating oil (see Table 2 in the Installation Section).

CAUTION

It is imperative you charge the oil into the receiver/separator prior to energizing the control panel to prevent burning out the immersion heater in the separator/receiver.

During operation, maintain the separator oil level in the normal operating range between the two bullseye sight glasses. If the oil level is visible only in the lowest sight glass, add oil to the operating compressor through the connection located at the compressor suction inlet. Pump oil into the compressor until the oil level in the separator is between the two bullseye sight glasses. Watch this level carefully to maintain proper operation. Never allow the oil to reach a level higher than indicated on the highest sight glass, since this may impair the operation and efficiency of the oil separator portion of this combination vessel.

B. Oil Filter

Change the oil filter after the first 200 hours of operation, as noted on the hour meter. Thereafter, replace the filter every six months, or when the oil pressure drop through the filter reaches 15 psi, whichever occurs first. The pressure drop across the filter is read on the microprocessor panel. Check the pressure drop and record it daily.

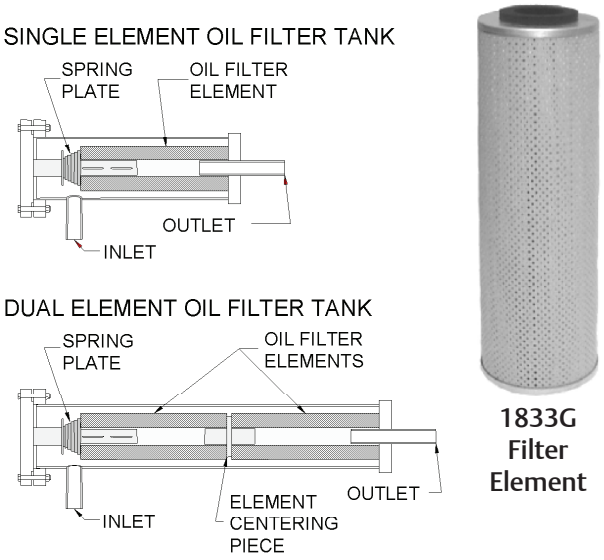
To prepare for the removal of the filter, shut down the compressor. Isolate the filter housing appropriately. If unit is equipped with duplex filter housings the unit does not have to be shut down, however the filter to be serviced must be isolated before the tank can be opened.

1. **Filter Removal, VSG Units using Vilter Part Number 1833G oil filter elements.**

   Release the pressure in the oil filter housing by opening the bleed valves at the stop valve in the block and bleed assembly, or at the bleed valve for the oil filter housing.

   Drain the filter housing in to an appropriate container and dispose of the oil in a appropriate manner following all Local, State and Federal ordinances regarding the disposal of used oil.

   Unscrew the bolts holding the cover flange to the tank. Remove the cover flange and spring plate. Pull out the filter element(s). Before reassembling, thoroughly clean the tank and spring plate to lengthen the life span of the filter element(s).



1833G Filter Element

FIGURE 3.
1833G FILTER ELEMENT TANKS

To replace the filter element(s), on single element tanks, insert the element and make sure it fits onto the outlet connection. Install spring plate, and bolt the cover assembly in place. On units equipped with dual element tanks, insert inner element and make sure it fits onto the outlet connection. Put the centering piece on the outer element and slide into tank making sure the center piece fits into the inner element. Put spring plate on outer element and bolt the cover assembly in place.

CAUTION

When changing filter, discard clogged filter only. Save and reuse spring plate and centering piece. This filter* MUST *be installed with the spring plate. A compressor that is allowed to operate without the spring plate is running with unfiltered oil.

The filter housing can be evacuated and then slowly pressurized to check for leaks before returning to service.

C. Oil Pressure Regulating

On units with a full time oil pump, the back pressure regulator, in the oil supply line from the separator, controls upstream pressure to the compressor bearings and should be adjusted to hold the oil pressure at 20 psig above suction pressure. Excess oil not required for bearing lubrication is passed through the regulator and flows into the separator.

D. Oil Cooling

Various types of oil coolers can be used to maintain the oil injection temperature, usually either a water-cooled shell-&-tube heat exchanger mounted locally or a remotely located air-cooled fan-coil unit. In either case, the oil temperature control valve operates the same. (See Appendix A: Pre Start Up for Remote Oil Coolers)

A two-way ball valve is located in the main oil line between the oil separator and the compressor. The oil cooler is piped in parallel to the oil temperature control valve, which acts as a by-pass valve (Figure 4).

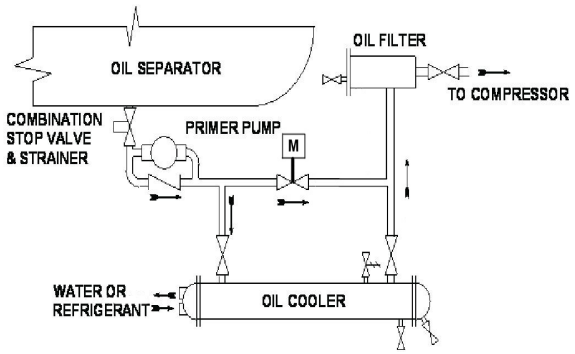


FIGURE 4.
TYPICAL WATER COOLED OIL COOLER DIAGRAM

1. Temperature Control Valve Installation & Position Indication

1.1 The ball valve is installed with the ball closed.

1.2 The actuator mounts on the ball valve stem. Flats on the ball valve stem indicate the position of the ball:
OPEN – stem flats are with the flow
CLOSED – stem flats are across the flow

1.3 On smaller valves, the ball valve stem flats are nearly hidden between the stem extension and the stem lock nut. The locking tabs on the stem lock nut are across the flow.

1.4 The actuator position indicator stem flats are oriented in the same direction as the ball valve stem flats.

1.5 There is a mechanical position indicator on the top of the actuator cover.

NOTE: The oil temperature control valve comes from the vendor already assembled with the ball closed and the actuator in the CLOSED position.

2. Control Action

2.1 The ball valve can rotate through a full 360° arc.

2.2 The actuator restricts the ball to a 90° arc of travel.

2.3 The actuator is powered (120V or 24V) all the time.

2.4 The position target signal from the compressor controller is a 4-20mA analog value.

2.5 There is no feedback position from the actuator.

3. Initial Position

3.1 With the electrical power to the valve de-energized, the valve is set to its initial position

by ensuring that the ball is in the closed position and that the actuator indicator displays CLOSED.
3.2 When the electrical power to the valve is energized, the valve should rotate to fully OPEN.

4. Operation

4.1 When initially installed, the ball must be in the closed position.

4.2 When electrically energized, if the compressor is not running, the compressor controller will turn the valve fully open (100%).

4.3 When the compressor starts, the valve remains fully open (100%) until the oil injection temperature rises above the control setpoint.

4.4 When the oil injection temperature rises above the control setpoint, the oil temperature control valve will begin to close.

4.5 The hot oil from the oil separator begins to divert to the oil cooler, mixing the hot and cooled oil flow streams together downstream of the oil temperature control valve. The valve can fully close (0%) diverting the entire oil flow stream to the oil cooler.

4.6 As the oil injection temperature drops below the setpoint, the oil temperature control valve begins to open so that the oil injection temperature does not become too cold.

4.7 When the compressor stops, the valve returns to fully open (100%).

5. Fail Position

The actuator remains in its last position when power is removed.

6. Screen Display

The oil temperature control valve, identified as "OIL MIX" on the main HMI display screen, shows a numerical value with "%" as units. This is to be understood as "% OPEN." It is a direct indication of the position of the ball valve.

6.1 100% OPEN
oil flow stream is entirely bypassing the oil cooler

6.2 99% to 1% OPEN
oil flow stream is partially by-passing the oil cooler and partially diverted to the oil cooler

6.3 0% OPEN
oil flow stream is entirely diverted to the oil cooler

G. Control Settings

The oil temperature control setpoints are entered on the compressor controller screen "Oil Mixing Valve PID (Oil Return from Cooler)".

8.0 Rotating the Actuator for Convenience of Installation

The actuator can be rotated to any one of four positions.

8.1 Remove both 120V and 24V power from the actuator.

8.2 Disconnect electrical leads at actuator.

8.3 Remove four cap screws that fasten the actuator to the valve mounting bracket.

8.4 Lift the actuator off the valve stem.

8.5 Rotate the actuator to the desired position.

8.6 Slide actuator down on the valve stem.

8.7 Secure the actuator to the valve mounting bracket with four cap screws.

8.8 Re-connect the electrical leads at the actuator.

8.9. Restore 120V and 24V power to the actuator.

NOTE: The ball valve and the actuator must always be assembled in the CLOSED position. See Section 3. Calibration above.

CAUTION: Be careful not to move the ball stem during this operation. Turning the ball valve 90° in either direction will reverse the control action of the valve and the compressor will experience high oil temperature within minutes. Turning the ball valve 180° has no detrimental effect.

9. Manual Override

The actuator has a handwheel that can be engaged to override the electrically determined position of the ball valve.
Push and rotate to engage.
Push a second time to de-clutch.

CONTROL SYSTEM

Equipped for automatic operation, the screw compressor unit has safety controls to protect it from irregular operating conditions, an automatic starting and stopping sequence, capacity and volume ratio control systems.

Check all pressure controls with a remote pressure source, to assure that all safety and operating control limits operate at the point indicated on the microprocessor.

The unit is equipped with block and bleed valves that are used to recalibrate the pressure transducers. To use the block and bleed valves to recalibrate the pressure transducers, the block valve is shut off at the unit and the pressure is allowed to bleed off by opening the bleed valve near the pressure transducer enclosure. The transducer can then be calibrated at atmospheric pressure (0 psig), or an external pressure source with an accurate gauge may be attached at the bleed valve.

The discharge pressure transducer cannot be isolated from its pressure source, so it is equipped with only a valve to allow an accurate pressure gauge to be attached and the pressure transducer calibrated at unit pressure.

Recheck the transducers periodically for any drift of calibration.

A. Screw Compressor Control And Operation

1. Starting, Stopping and Restarting the Compressor.

Before the screw compressor unit may start, certain conditions must be met. All of the safety setpoints must be in a normal condition, and the suction pressure must be above the low suction pressure setpoint to assure that a load is present. When the "On-Off" switch or "Manual-Auto" button is pressed, the oil pump will start. When sufficient oil pressure is built up and the compressor capacity control and volume ratio slide valves are at or below 10%, the compressor unit will start.

If the compressor is in the automatic mode, it will now load and unload and vary the volume ratio in response to the system demands.

Stopping the compressor unit can be accomplished a number of ways. Any of the safety setpoints will stop the compressor unit if an abnormal operating condition exists. The compressor unit "On-Off" or stop button will turn the compressor unit off as will the low pressure setpoint. If any of these conditions turns the compressor unit off, the slide valve motors will immediately energize to drive the slide valves back to 5% limit. The control motors will be de-energized when the respective slide valve moves back below 5%. If there is a power failure, the compressor unit will stop. If the manual start on power failure option is selected (see appropriate Microprocessor Instruction Manual), restarting from this condition is accomplished by pushing the reset button to insure positive operator control. If the auto start on power failure option is selected (see appropriate Microprocessor Instruction Manual), the compressor unit will start up after a waiting period. With both options, the compressor slide valves must return below their respective 5% limits before the compressor unit can be restarted.

2. Slide Valve Control Actuators

Capacity and volume ratio control of the screw compressor is achieved by movement of the respective slide valves, actuated by electric motors.

Note:
Optical Actuators CAN NOT be manually rotated.

(The VSG 501-701 models will have motor locations opposite of figure #6)

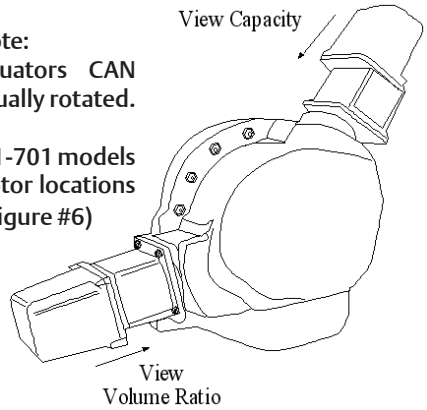


FIGURE 6.
SLIDE VALVE MOTOR LOCATION

When viewing the compressor from the discharge end (opposite the drive end), the upper motor is for capacity control. The command shaft turns (see Table 1) to decrease the capacity to 10% and reverses to increase the capacity to 100%. The lower motor is for volume ratio control. The command shaft turns (see Table 1) to reduce the volume ratio to 2.0, and reverses to increase the volume ratio to 5.0.

Actuation of the electric motors can be done manually or automatically. To actuate the motors manually, place the desired mode selector in the manual position and push the manual Increase or Decrease buttons. In the automatic mode, the microprocessor determines the direction to actuate the electric motors. However, in the automatic mode, there is an "On" and "Off" time for the capacity control motor. The "On" time is the time in which the slide valve moves, and the "Off" time is the time in which the system is allowed to stabilize before another change in slide valve position.

Table 1

COMP. MODEL	COMMAND SHAFT ROTATION CAPACITY INC	CAPACITY DEC	VOLUME INC	VOLUME DEC	NO. OF TURNS / ROTATION CAPACITY TURNS/DEGREES/TRAVEL	ANGLE / SLIDE TRAVEL VOLUME TURNS/DEGREES/TRAVEL
VSSG 291	CW	CCW	CW	CCW	0.91 / 328 / 3.568"	0.52 / 187 / 2.045"
VSSG 341	CW	CCW	CW	CCW	0.91 / 328 / 3.568"	0.52 / 187 / 2.045"
VSSG 451	CW	CCW	CW	CCW	0.91 / 328 / 3.568"	0.52 / 187 / 2.045"
VSSG 601	CW	CCW	CW	CCW	0.91 / 328 / 3.568"	0.52 / 187 / 2.045"
VSG 751	CCW	CW	CCW	CW	1.09 / 392 / 4.283"	0.63 / 227 / 2.473"
VSG 901	CCW	CW	CCW	CW	1.09 / 392 / 4.283"	0.63 / 227 / 2.473"
VSG 791	CCW	CW	CCW	CW	1.22 / 439 / 4.777"	0.74 / 266 / 2.889"
VSG 891	CCW	CW	CCW	CW	1.22 / 439 / 4.777"	0.74 / 266 / 2.889"
VSG 1051	CCW	CW	CCW	CW	1.22 / 439 / 4.777"	0.74 / 266 / 2.889"
VSG 1201	CCW	CW	CCW	CW	1.22 / 439 / 4.777"	0.74 / 266 / 2.889"
VSG 1551	CCW	CW	CCW	CW	1.36 / 490 / 5.325"	0.82 / 295 / 3.200"
VSG 1851	CCW	CW	CCW	CW	1.36 / 490 / 5.325"	0.82 / 295 / 3.200"
VSG 2101	CCW	CW	CCW	CW	1.36 / 490 / 5.325"	0.82 / 295 / 3.200"
VSG 301	CW	CCW	CW	CCW	0.80 / 288 / 3.141"	0.45 / 162 / 1.767"
VSG 361	CW	CCW	CW	CCW	0.80 / 288 / 3.141"	0.45 / 162 / 1.767"
VSG 401	CW	CCW	CW	CCW	0.80 / 288 / 3.141"	0.45 / 162 / 1.767"
VSG 501	CCW	CW	CCW	CW	0.91 / 328 / 3.568"	0.52 / 187 / 2.045"
VSG 601	CCW	CW	CCW	CW	0.91 / 328 / 3.568"	0.52 / 187 / 2.045"
VSG 701	CCW	CW	CCW	CW	0.91 / 328 / 3.568"	0.52 / 187 / 2.045"

The Motor Amps Load Limit protects the compressor from overloading by decreasing the compressor capacity if the motor amperage is at the Maximum Amps setpoint, or preventing an increase in capacity if the motor amperage is above the Full Load Amps setpoint. (See Compact Logix PLC manual, p/n 35391CL.)

3. Oil Separator Heater

The oil separator heater keeps the oil in the separator from becoming too viscous and helps keep gas from condensing in the receiver section of the separator.

The heater is turned on only when the compressor is off. The separator heater is supplied with an integral temperature control.

B. Safety Setpoints

A detailed explanation of all safety setpoints can be found in the Compact Logix PLC manual, p/n 35391CL.

1. Oil Pressure

Low oil pressure differential stops the compressor unit when there is an insufficient difference in pressure between the oil manifold and suction.

2. Discharge Pressure

High discharge pressure cutout stops the compressor unit, when the discharge pressure in the oil separator exceeds the setpoint.

3. Suction Pressure

Low suction pressure cutout stops the compressor unit when the suction pressure drops below the setpoint.

4. Oil Filter Differential

High oil filter differential cutout stops the compressor unit when the difference between the outlet and inlet of the filter exceeds the setpoint.

5. Oil Temperature

The oil temperature cutout stops the compressor unit when the oil temperature is too high or too low.

6. Discharge Temperature

The high discharge temperature cutout stops the compressor unit when the discharge temperature exceeds the setpoint.

INITIAL START-UP

A. Setting of Controls

Refer to the Compact Logix PLC manual (p/n 35391CL) for a list of initial settings.

B. Valve Settings

1. The suction line uses separate stop and check valves. Ensure the suction stop valve is open prior to starting.

2. The ¼" suction equalization valve should be closed during operation. The valve enables the unit to slowly equalize to low side pressure during off periods. This valve must be adjusted to minimize oil loss when compressor stops.

3. The discharge line uses separate stop and check valves. Ensure the discharge valve is open prior to starting.

4. Manually open the oil isolating valve at the oil separator outlet connection.

5. Open the isolating valve(s) before and after the oil filter housings.

6. Manually open the stop valve on the oil bleed return line from the element section and open the expansion valve 1/2 of a turn. See Figure 7.

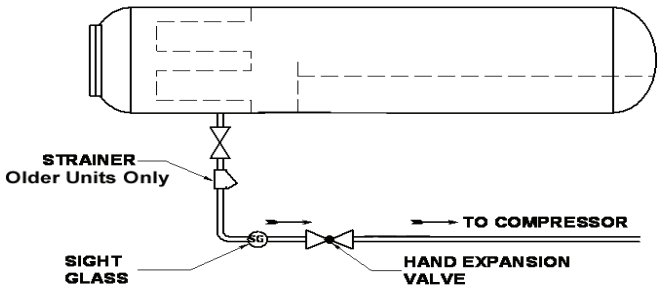


FIGURE 7.
OIL SEPARATOR BLEED LINE

NOTE:
The purpose of the oil bleed return assembly is to collect any oil that passes through the oil separating element and returns that oil to the compressor. The hand expansion valve should be adjusted to prevent an oil level from forming in the sight glass when the compressor is at 100% capacity. Generally 1/2 to 1 turn open is satisfactory.

7. Open 1/4" high pressure gas line valve piped to oil injection line just enough to quiet compressor at 100% capacity.

E. Compressor Pre Start-Up Check List

Before proceeding with actual starting of the compressor, the items listed on the "Pre Start-Up Check List" must be verified. Time and money will be saved before the Vilter start-up technician arrives. (See next page.)

Pre Start-Up Checklist

The following Check List is to help prepare the equipment before the Vilter Technician arrives at the jobsite. Vilter recommends that a Trained Technician go through the following tasks. The operating Manuals provided by Vilter, can be referenced for any type of questions or special instructions.

Every Gas Compression unit includes a Vilter Start-Up (Confirm on PO). The following tasks are not included in the Vilter Start-up provided in your equipment purchase. Any tasks below that are done by the Vilter Technician will take away from the pre-determined time that was provided with the equipment purchase. Vilter suggests that the Vilter Technician's time be used during the start-up of the System and not for the below System Preparation.

Note: Each item below MUST be "Checked-Off", Signed and Returned to the Vilter Service Department. Failure to do so will "Null & Void" future Warranty considerations.

VILTER COMPRESSORS

- ☐ 1. The unit should be leveled and secured to the mounting pad or floor.
- ☐ 2. Proper electric supply and grounding need to be supplied to the unit. All power and control lines should be wired to unit. Electric supply to be verified at each device requiring power.
- ☐ 3. Verify Any type of Level Switches that are on a Vessel before the compressor are hardwired and able to Shut Off the compressor (Should be wired to Aux on Micro & Starter).
- ☐ 4. The suction and discharge line must be piped and properly supported independent of the unit.
- ☐ 5. The Discharge Stop and Check Valve is shipped loose and must be installed. During off periods, liquid can condense in the line downstream of the Discharge Stop and Check Valve. It is recommended that the Stop and Check Valve be located to minimize the quantity of liquid that can accumulate downstream of the valve.
- ☐ 6. A Dual Safety Relief Valve is shipped loose for field installation. A connection is provided on the oil separator for the relief valve. Refer to ASME Code for proper sizing of relief valves and vent lines.
- ☐ 7. On Water Cooled Oil Coolers, the Water Lines must be connected to the front head of the Oil Cooler. Water regulating and solenoid valves are recommended.
- ☐ 9. On Air Cooled Oil Coolers, the oil lines from the compressor must be connected to the Air Cooled oil cooler. Oil Cooler Fans will need to be wired and checked for proper rotation. See air cooled section for further detail. (Note the line going to the Air Cooled unit from the compressor should be connected to the bottom connection of the Air Cooled Oil Cooler and the Return line to the compressor oil cooler should be connected to the top of the Air Cooled Oil Cooler – Refer to Standard Drawing in Manual).
- ☐ 10. The oil separator should be charged with oil until the oil level is halfway in the top sight glass.. An oil charging connection is provided on the bottom of the oil separator. For oil specifications and quantity, refer to the Installation Section in the Operation & Service Manual.

Pre Start-Up Checklist

- [ ] 11. The center member of the compressor is shipped loose to help facilitate final field alignment and allow for motor rotation check. The motor alignment should be within 0.004" total indicator reading in all directions
- [ ] 12. Both the compressor and motor hubs should be checked for concentricity and perpendicularity.
- [ ] 13. The motor should be checked and shimmed for a soft foot prior to attempting final alignment.
- [ ] 14. The motor should be checked to make sure that it is greased properly- (Note MOTOR MUST BE REGREASED AFTER 40 HRS OF RUNNING TIME-SEE TOSHIBA MOTOR INSTRUCTIONS PROVIDED WITH THE UNIT).
- [ ] 15. The center section of the coupling should be left out to allow the start-up technician to verify the final alignment and motor rotations.
- [ ] 16. Charge Unit with oil to designated level in the Compressor Oil Separator (Refer to Drawings for Correct Oil Charge and Manual for proper height between sight glasses).
- [ ] 17. Verify Position of all Valves are open.
- [ ] 18. A system load should be available at the time of startup.
- [ ] 19. The unit should be pressure tested and purged with a dry gas. Care should be taken to not pressurize excessively from the suction end of the compressor, as this will drive the compressor in a forward motion without lubrication and may cause damage.
- [ ] 20. Have a qualified electrician present to verify wiring, during startup.
- [ ] 21. Keep a Hard Copy of the final set points in case the Micro gets corrupted or if they are required by Vilter technicians for trouble shooting.

GROUP	INSPECTION OR MAINTENANCE ITEM	SERVICE INTERVAL (HOURS) BASED ON DRY CLEAN GAS													
		200	5,000	10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000	100,000	110,000	120,000
OIL CIRCUIT															
	Oil Change		R		R		R		R		R		R		R
	Oil Analysis (1)		S	S	S	S	S	S	S	S	S	S	S	S	S
	Oil Filters	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	Oil Strainer	I	I	I	I	I	I	I	I	I	I	I	I	I	I
PACKAGE															
	Coalescing Elements					R			R			R			R
	Suction Screen	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	Coupling Alignment and Integrity	I	I	I	I	I	I	I	I	I	I	I	I	I	I
CONTROL CALIBRATION															
	Transducers	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	RTD's	I	I	I	I	I	I	I	I	I	I	I	I	I	I
COMPRESSOR (2)															
	Inspect Compressor		I		I		I		I		I		I		I
	Bearings														I
	Key:	(I) Inspect.		(R) Replace.				(S) Sample.							

(1) Note: Oil Analysis/Sampling is based on the gas stream. It is at the customer's discretion to increase the time period between oil sampling if contamination of oil is unlikely, and to decrease the time period between oil sampling if oil contamination is likely or evident. An oil sample must be taken when there is reason to believe the oil is contaminated anytime during operation. In landfill, corrosive, and wet gas conditions, oil sampling is recommended every 3-4 months.

The life of the oil is directly affected by the quality of the gas. Proper separation of any liquids must be accomplished to prevent droplets of liquid at the compressor suction. The discharge temperature of the compressor must be kept a minimum of 30°F above the discharge gas dew point to prevent the condensing of liquids in the oil separator. The oil separator shell and legs must be insulated when the gas stream has a high probability of having condensables.

(2) Note: The life of the compressor will be increased by purging the compressor unit with dry nitrogen or sweet, dry natural gas at shutdown.

NOTE: See Motor Manual for proper lubrication procedures and service intervals.

GENERAL COMMENTS

When working on the compressor, care must be taken to ensure that contaminants (i.e. water from melting ice, dirt and dust) do not enter the compressor while it is being serviced. It is essential that all dust, oil or ice that has accumulated on the outside of the compressor be removed before servicing the compressor.

When servicing the compressor, all gaskets, O-rings, roll pins and lock washers must be replaced when reassembling the compressor.

PREPARATION OF UNIT FOR SERVICING

A) Shut down the unit, open the electrical disconnect switch and pull the fuses for the compressor motor to prevent the unit from starting. Put a lock on the disconnect switch and tag the switch to indicate that maintenance is being performed.

B) Isolate the unit by manually closing the discharge Stop valve. Allow the unit to equalize to suction pressure before closing the Suction Bypass. After the unit has equalized to suction pressure and suction valve closed, use an acceptable means to depressurize the unit that complies with all Local, State and Federal Ordinances.

C) Remove drain plugs from the bottom of compressor housing and the discharge manifold. Drain the oil into appropriate containers.

REMOVAL OF COMPRESSOR FROM THE UNIT

After preparing the unit for service, the following steps should be followed when removing the compressor from the unit:

A) Disconnect the motor drive coupling from the compressor input shaft.

B) Disconnect all gas and oil piping which is attached to the compressor. When removing the suction strainer on gas compression units, the suction line should be supported to prevent it from sagging.

C) Replace oil drain in compressor housing and discharge manifold after oil has stopped draining.

D) Remove all electrical connections to the compressor.

E) On VSG compressors with mounting feet, loosen and remove bolts holding the compressor to the base.

Keep compressor alignment shims together and mark the locations with a permanent marker.

F) On VSG comnpressors with C- flange the motor/C-flange/compressor assembly must be supported with a chain fall or other lifting device before the bolts holding the compressor to the C-flange adapter can be removed.

G) Install appropriate lifting eye into the threaded hole on the top of the compressor.

Verify unit is properly secured to avoid compressor from falling. Re-verify all piping and electrical are properly disconnected prior to lifting unit.

H) Lift compressor from the base, verify the amount of room needed for clearance and weight of the bare compressor when the compressor is removed from the unit.

INSTALLATION OF THE COMPRESSOR

A) After the work has been completed, reinstall the compressor on the base or C-flange adapter (dependent upon compressor model).

B) On the VSG units, replace the shims under the compressor feet. Check for a soft foot. This is accomplished by tightening down three of the hold down bolts and checking the clearance under the fourth compressor foot. If there is clearance, add the appropriate amount of shims. Tighten down the fourth bolt and loosen either adjacent bolt and check again for clearance, adding shims accordingly. Align the compressor and motor.

   On VSG compressors the discharge elbow should be tightened on the separator first, before the compressor manifold flange is tightened. This should be done to prevent compressor to motor misalignment.

   Replace all electrical, gas and oil connections removed when servicing the compressor.

LEAK CHECKING UNIT

Note: Unit can be leak checked before evacuation.

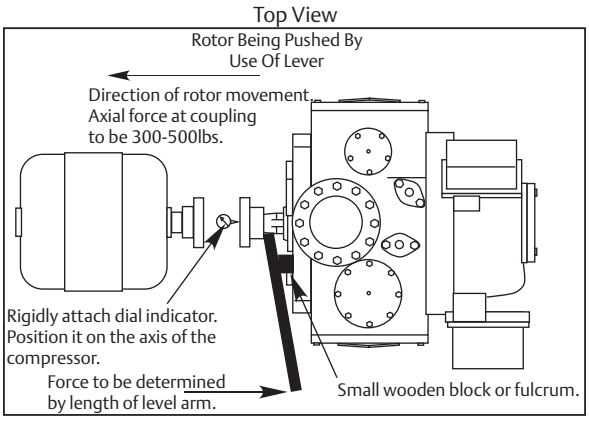
CAUTION

Slowly pressurize the unit from the discharge side of the compressor. Pressurizing the compressor from the suction side may cause rotation of the compressor without oil supply, which could lead to internal damage.

A) Use a vacuum pump to evacuate the unit.

B) Break the vacuum on the unit using dry nitrogen and check for leaks. Concentrate on areas where work was done.

C) If no leaks are found, the unit can be returned to service.



COMPRESSOR INSPECTION

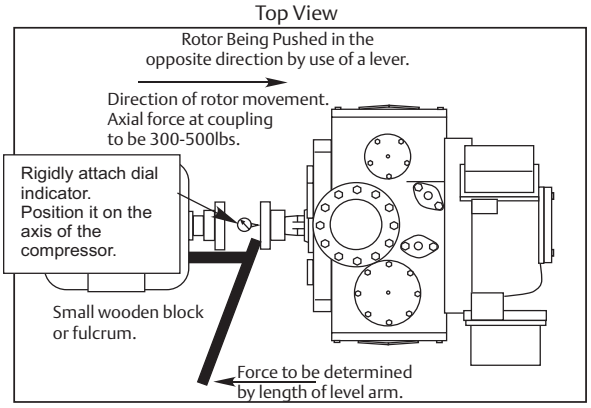
The Vilter Single Screw Compressor is designed for long periods of trouble free operation with a minimum of maintenance. However, a yearly inspection is recommended so any irregular wear is noted and rectified. At this time, the bearing float is measured for the main rotor and gate rotors.

The following are the procedures used in measuring the main rotor and gate rotor bearing float.

BEARING CHECK

CAUTION

When taking the measurements, do not exceed 300 to 500 Lbs. of force at point of contact or damage may result to the bearings



A) Shut down and de-pressurize the unit.

B) Main rotor bearing float.

1) Remove the coupling guard, then remove the center member from the coupling.

2) Attach a dial indicator to the compressor frame as shown and zero indicator. Place a lever arm and fulcrum behind the compressor coupling half and push the coupling towards the motor (note measurement).

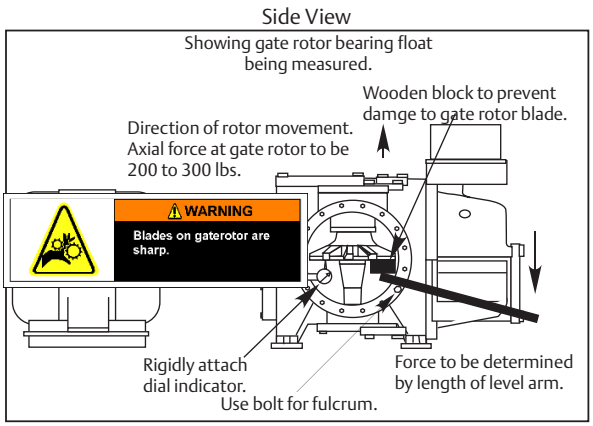


TABLE.1 MAXIMUM BEARING FLOAT

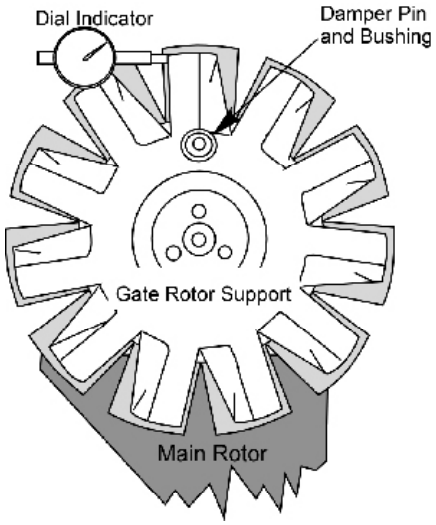
	MAIN	GATE
Bearing Float	0.003”	0.002”
Maximum Force	300 to 500 Lbs.	200 to 300 Lbs.

3) Re-Zero indicator, now position the fulcrum on the motor and use the lever arm to push the input shaft towards the compressor (note measurement).

4) Add both readings, the total indicator movement is the bearing float and this should not exceed 0.003".

C) Gate rotor bearing float.

1) Remove the side covers and position a dial indicator on the gate rotor.
2) Use a lever arm pivoting on a bolt with a small block of wood against the gate rotor blade to protect the blade.
3) The maximum amount of bearing float should not exceed 0.002".



D) Measure the gate rotor to blade float. Some movement between blade and support is necessary to prevent damage to the compressor blade, however at no time should the blade uncover the support.

1) Position the blade with the gate rotor damper pin and 90º to the main rotor.

2) Position a dial indicator at the tip of the support. The total movement of the damper pin in the bushing is the gate rotor float. Refer to table 0.2 to find the maximum blade to support float (on new compressor parts only).

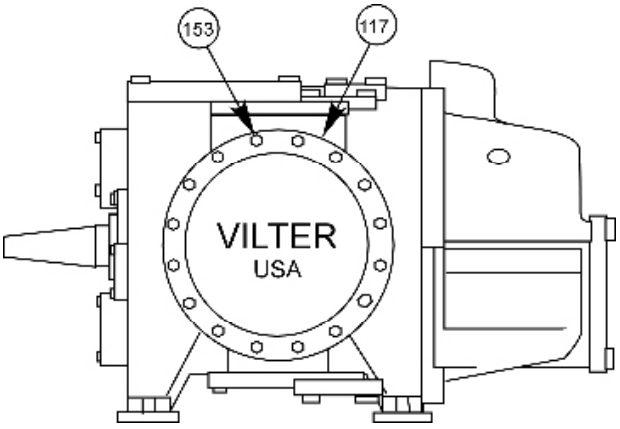
TABLE 2. GATE ROTOR FLOAT

MODEL	FLOAT
VSG 301 THRU 401	0.045"
VSG 501 THRU 701	0.045"
VSSG 291 THRU VSSG 601	0.045"
VSG 751 & VSG 901	0.055"
VSG 1051 & VSG 1201	0.060"
VSG 1551 & VSG 2101	0.060"

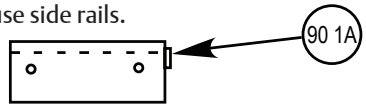
E) Readings could be higher than 0.020. If readings is greater than 0.030 over table tolerance contact Vilter's home office.

F) Inspect the main and gate rotors for signs of abnormal wear due to dirt or other contaminants.

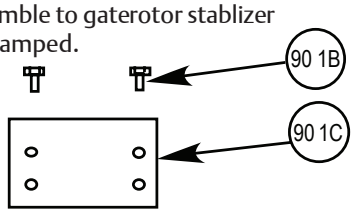
G) After the inspection is complete, the covers, coupling center member and guard can be reinstalled and the unit can then be evacuated and leak checked before starting.



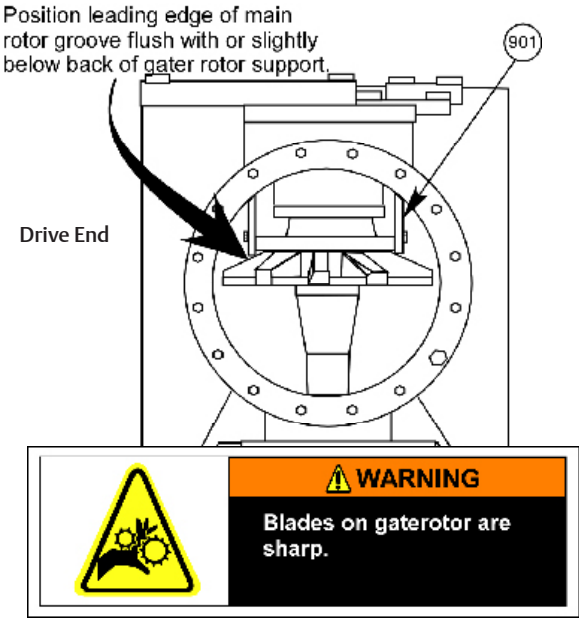
For VSG 451 thru 601 compressors, do not use side rails.



For VSSG 751/901 & VSG 1051/1201 compressors, use side rails and assemble to gaterotor stablizer as stamped.



Position leading edge of main rotor groove flush with or slightly below back of gater rotor support.



GATE ROTOR ASSEMBLY CAUTION

Gate rotor removal and assembly is divided into distinct instructions, instructions for all VSG and VSSG models and different instructions for all VSM models. Please follow the appropriate set of instructions.

REMOVAL (All VSG)

A) Prepare the compressor for servicing.

NOTE: All parts must be kept with their appropriate side and not mixed when the compressor is reassembled.

B) Remove two upper bolts from the side cover, and install guide studs in the holes. Remove the remaining bolts and side cover. There will be some oil drainage when the cover is removed.

C) Turn the main rotor so a driving edge of any one of the main rotor grooves is even with the back of the gate rotor support.

D) Insert the gate rotor stabilizer. The side rails are not required on VSSG 291 thru 601. For the VSG 751 thru 901 and VSG 1051 thru 1201 compressors, use the side rails and assemble to the gate rotor stabilizer as stamped. For the VSG 1551 thru 2101, use the side rails and assemble to the gate rotor stabilizer.

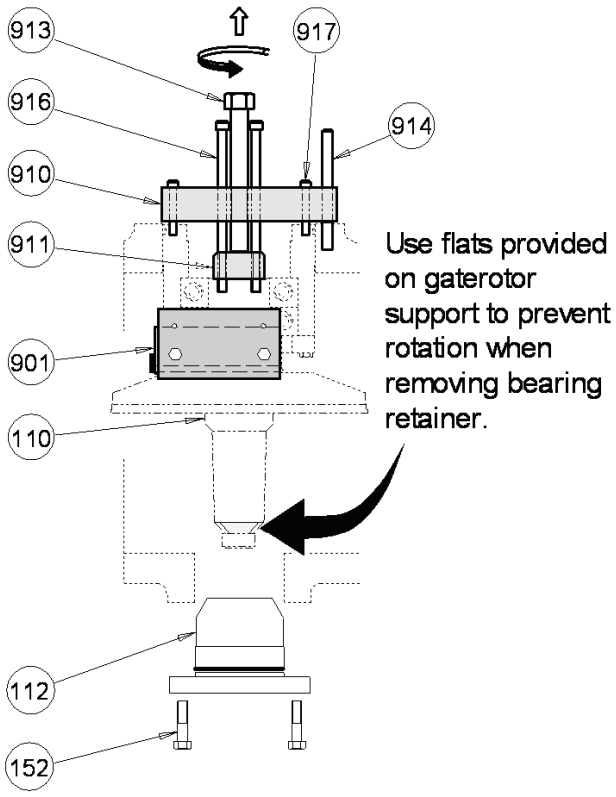
The gate rotor stabilizer is designed to hold the gate rotor support in place and prevent damage to the gate rotor blade as the thrust bearings and housing is being removed.

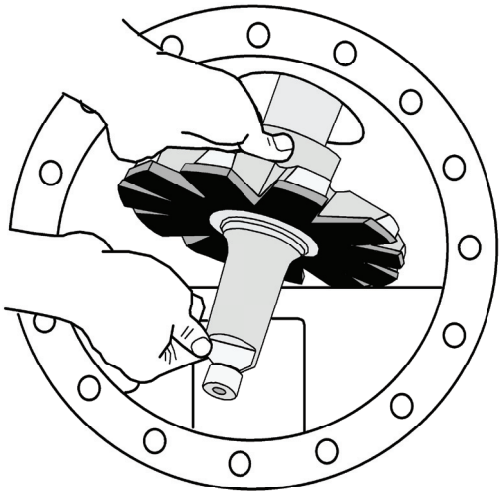
E) Remove the hex head and socket head bolts from the thrust bearing cover. Insert two of the bolts into the threaded jacking holes to assist in removing the cover. Retain the shim pack and keep it with the bearing housing cover.

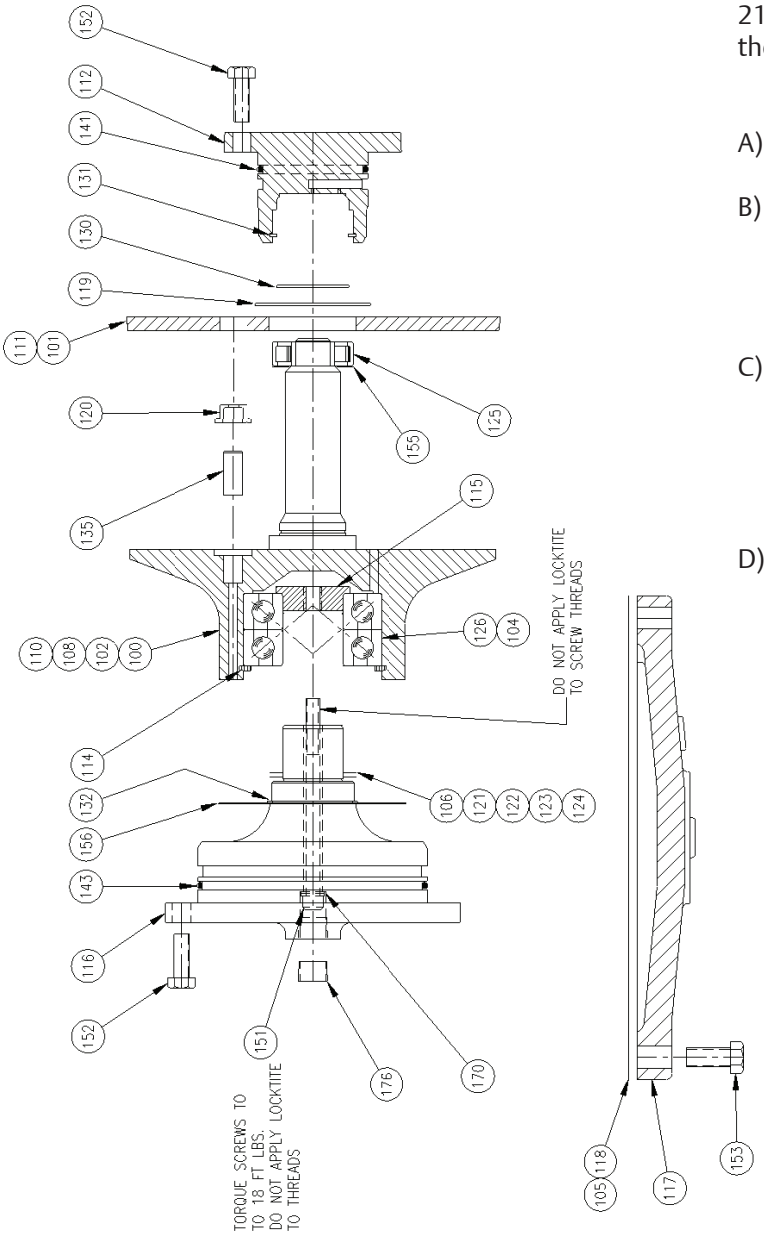
F) Hold the gate rotor support with a suitable wrench on the flats provided near the roller bearing housing. Remove the inner retainer bolts and the retainer. To remove the thrust bearing housing, install the thrust bearing removal and installation tool with the smaller puller shoe. Turn the jacking screw clockwise. The thrust bearings and housing assembly will be pulled off the shaft and out of the frame.

G) Remove the bolts on the roller bearing housing. Thread two bolts into the jack screw holes provided in the housing to assist in removing it.

H) To remove the gate rotor support, carefully move the support opposite the direction of rotation and tilt the roller bearing end towards the suction end of the compressor. The compressor input shaft may have to be turned to facilitate the removal of the gate rotor support. On dual gate compressor units, repeat the procedure for the remaining gate rotor support assembly.







REMOVAL (ALL VSG 301-701 MODELS)

The removal of the gate rotor assembly for the VSG 301-701 compressors is similar for the VSG 901-2101 compressors. The inner races are secured to the stationary bearing spindle.

A) Prepare the compressor for servicing.

B) Remove the upper bolt from the side cover and install a guide stud in the hole. Remove the remaining bolts and side cover. There will be some oil drainage when the cover is removed.

C) The side cover that contains the suction strainer should have the suction line properly supported before the bolts securing the line to the cover can be removed. After the line is removed, the cover can be removed per paragraph B.

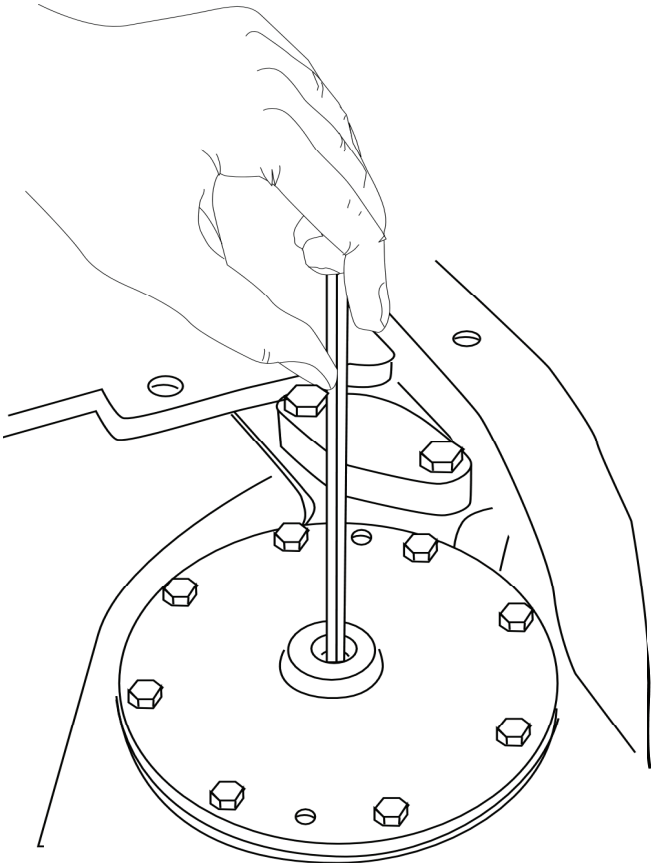
D) Turn the main rotor so the driving edge of the groove is between the top of the shelf or slightly below the back of the gate rotor support. At this point install the gate rotor stabilizing tool.

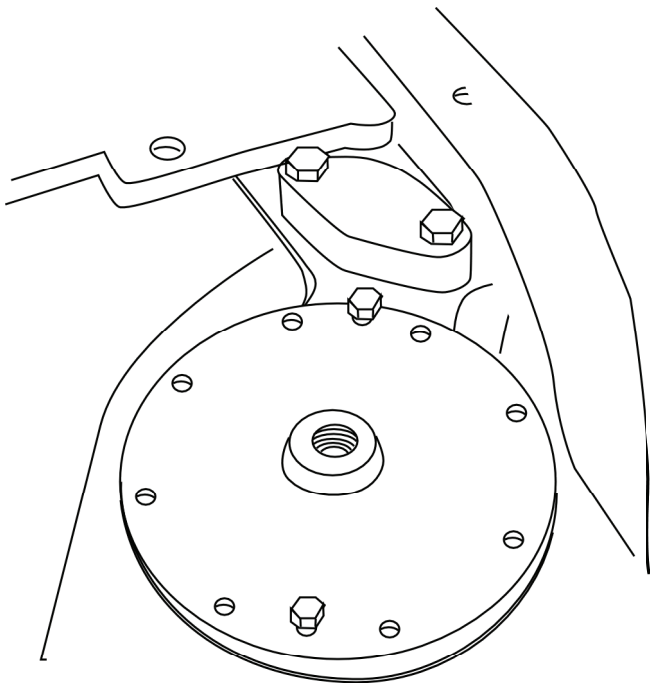
E) Remove plug on the thrust bearing housing. Loosen the socket head cap screw that is located underneath the plug. This secures the inner races of the thrust bearings to the spindle.

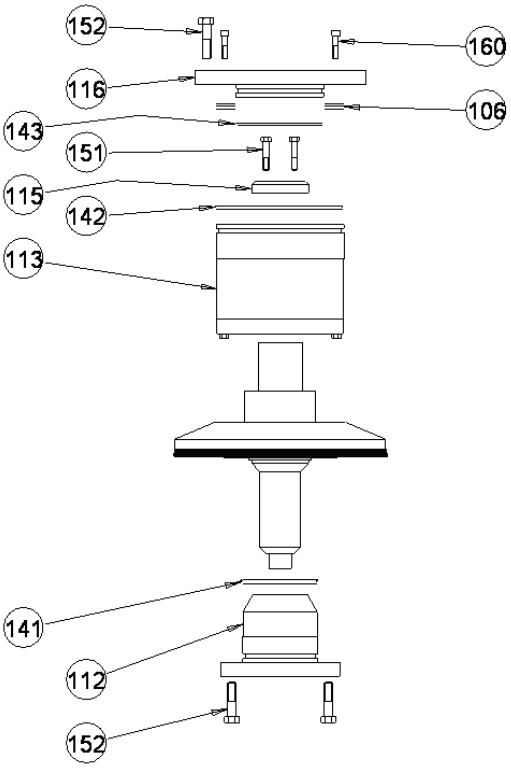
F) Remove bolts that hold the thrust bearing housing to the compressor. Insert two of the bolts into the threaded jacking holes to assist in removing the bearing housing from the compressor. When the housing is removed, there will be shims between the spindle and thrust bearings. These control the clearance between the shelf and gate rotor blades. These must be kept with their respective parts for that side of the compressor.

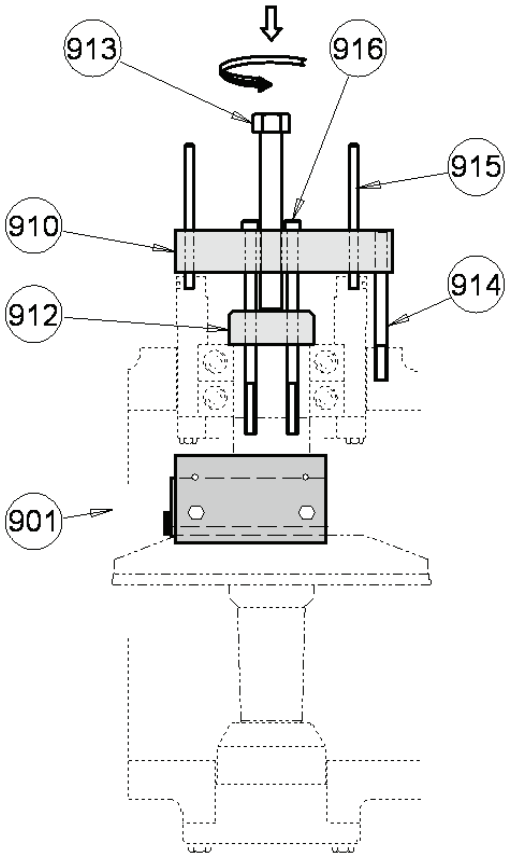
G) Remove the bolts from the roller bearing housing. After the bolts have been removed, the housing can be removed from the compressor.

H) To remove the gate rotor support, carefully move the support opposite the direction of rotation and tilt the roller bearing end towards the suction end of the compressor. The compressor input shaft may have to be turned to facilitate the removal of the gate rotor support. On dual gate versions, repeat the procedure for the remaining gate rotor support assembly.









INSTALLATION (All VSG Models)

A) Install the gate rotor support by carefully tilting the roller bearing end of the gate rotor support towards the suction end of the compressor. The compressor input shaft may have to be rotated to facilitate the installation of the gate rotor support.

Install gate rotor stabilizer. The gate rotor stabilizer (901) will hold the gate rotor support in place as the thrust bearing housing is being installed. If the gate rotor support is not restricted from moving, the gate rotor blade may be damaged.

B) Install the roller bearing housing (112) with a new O-ring (141). Tighten the bolts (152) to the recommended torque value.

C) When installing the thrust bearing housing (113), a new O-ring (142) must be used when the housing is installed. Lubricate the outside of the housing and bearings with clean compressor oil to aid in the installation. Due to the fit of the bearings on the gate rotor shaft, the thrust bearing removal and installation tool with the pusher shoe must be used. Turn the jacking screw clockwise. This will push the thrust bearings onto the shaft and push the housing assembly into the frame. Install the inner retainer (115) and bolts (151) using Loctite® 242 thread locker. Tighten the bolts to the recommended torque value.

D) Set the clearance between the gate rotor blade and the shelf.

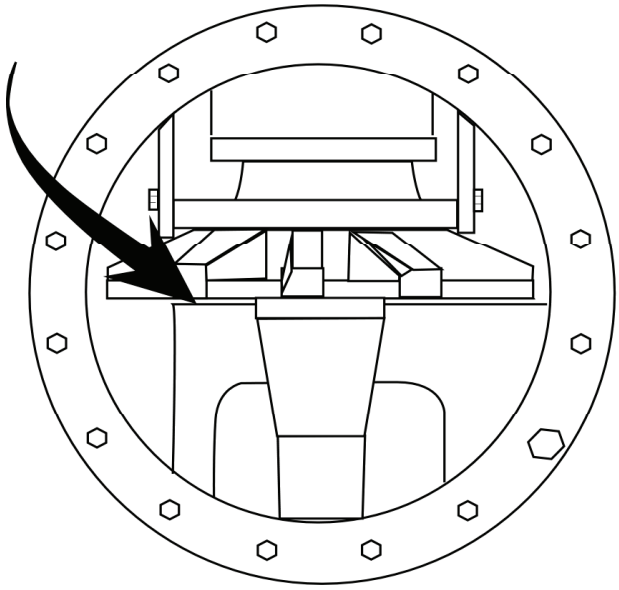
1. Place a piece of 0.003”-0.004” shim stock between the gate rotor blade and the shelf.
2. Measure the depth from the top of the compressor case to the top of the thrust bearing housing. This determines the amount of shims needed for the correct clearance.
3. Use factory installed shim pack (106) and bearing housing cover (116) without the O-ring (143). Check the clearance between the entire gate rotor blade and the shelf, rotate the gate rotor to find the tightest spot. It should be between 0.003”-0.004”. Make adjustments, if necessary. It is preferable to shim the gate rotor blade looser rather than tighter against the shelf.

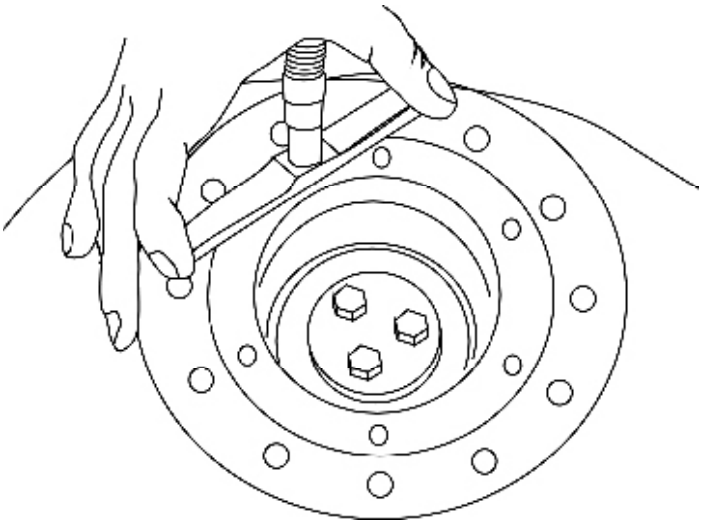
Note: Replacement blades are precisely the same dimensionally as blades installed originally at factory: Therefore, the same amount of shims will be required for replacement blades.

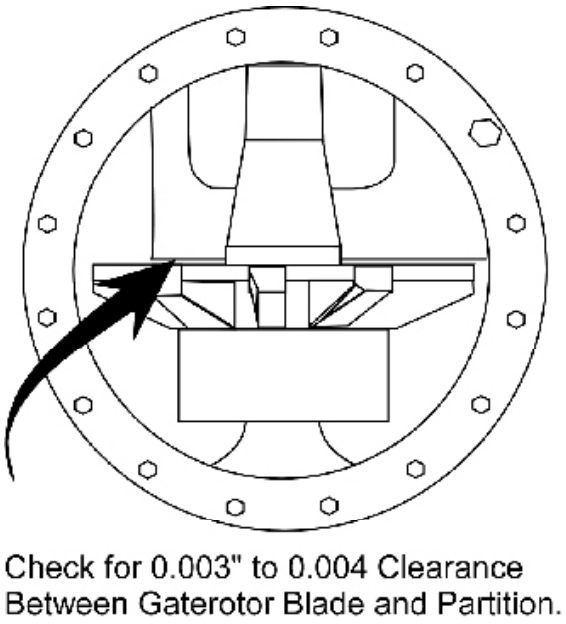
E) After clearance has been set install a new O-ring (143) on bearing housing cover, install cover and tighten the bolts to the recommended torque value.

F) Install side cover with a new gasket. Tighten the bolts to the recommended torque value. The unit can then be evacuated and leak checked as outlined in section 0.03.

Check for 0.003" to 0.004 Clearance Between Gaterotor Blade and Partition.







Gaterotor for C-flange Models

INSTALLATION (All VSG 301-701 Models)

A) Install the gate rotor support. Carefully tilt the roller bearing end of the gate rotor support towards the suction end of the compressor. The compressor input shaft may have to be rotated to facilitate the installation of the gate rotor support.

B) Install the roller bearing housing with a new O-ring. Tighten the bolts to the recommended torque value.

C) Install the spindle with shims and o-ring, tighten the bolts to the recommended torque value, measure the clearance between the shelf and blade.

D) Check the clearance between the entire gate rotor blade and the shelf, rotate the gate rotor to find the tightest spot. It should be between 0.003”-0.004”. Make adjustments, if necessary. It is preferable to shim the gate rotor blade looser rather than tighter against the shelf.

E) Once the clearance is set remove the spindle. Install new o-ring, apply Loctite 242 thread locker to the socket head cap screw clamping the thrust bearings to the spindle. Torque all bolts to the recommended torque values.

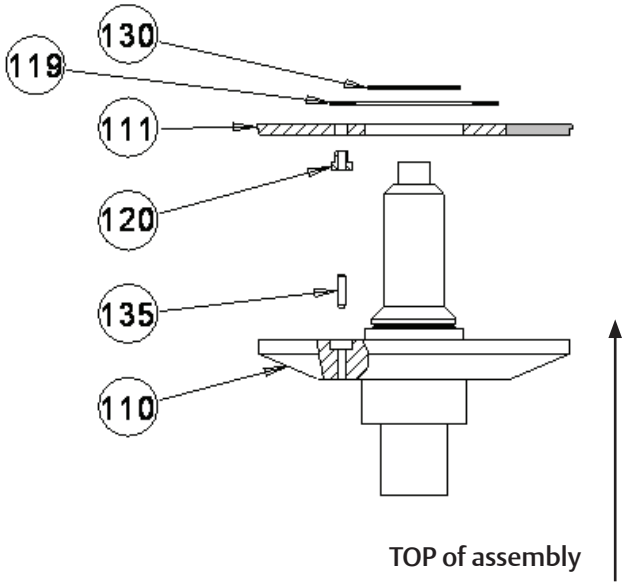
F) Install side covers with new gaskets. Tighten bolts to the recommended torque value. The unit can now be evacuated and leak checked as outlined in section 0.03.

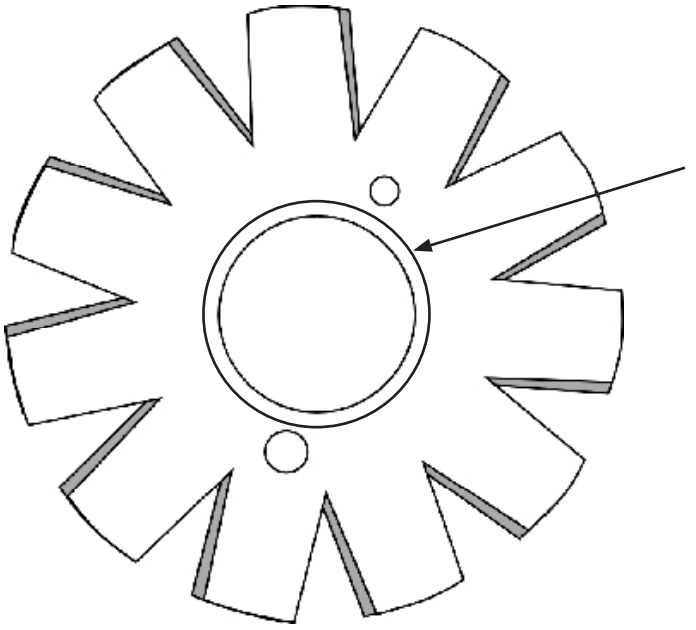
GATE ROTOR BLADE REMOVAL

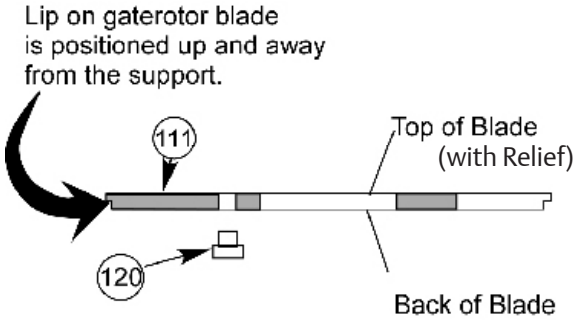
A) Remove the gate rotor assembly.

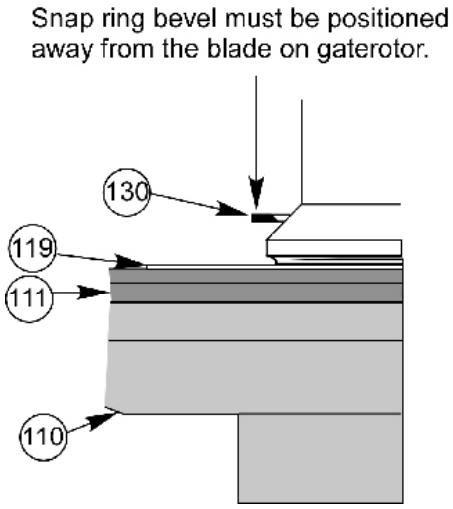
B) Remove the snap ring and washer from the gate rotor assembly. Lift gate rotor blade assembly off the gate rotor support.

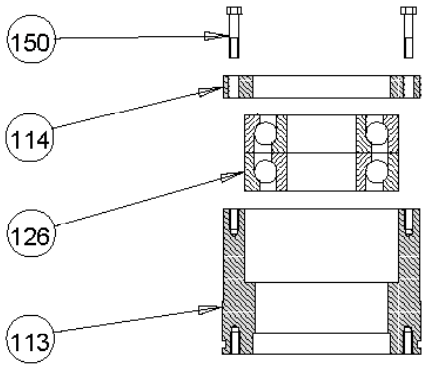
C) Check damper pin and bushing for excessive wear. Replace if necessary.











GATE ROTOR BLADE INSTALLATION

A) Install damper pin bushing (120) in gate rotor blade (111) from the back side of the blade. Be sure the bushing is fully seated.

B) Place the blade assembly on the gate rotor support. Locating Damper over pin.

C) Install washer (119) and snap ring (130) on gate rotor assembly. The bevel on the snap ring must face away from the gate rotor blade. After the gate rotor blade and support are assembled, there should be a small amount of rotational movement between the gate rotor and support.

D) For installation of the gate rotor assembly and setting of gate rotor clearance, refer to section INSTALLATION (All VSG 301-701 Models).

GATE ROTOR THRUST BEARING REMOVAL

A) Refer to section **INSTALLATION (All VSG Models)** for removal of the gate rotor bearing housings and gate rotor supports.

B) For removal of thrust bearings on VSG units:

1) Remove bolts (150) from the clamping ring (114).

2) Remove thrust bearing clamping ring.

3) Remove thrust bearings (126) from housing (113).

C) For removal of thrust bearings on VSSG units:

1) Remove retaining ring from gate rotor support.

2) Remove bearings from support.

3) Remove bearing retainer from inner race.

GATE ROTOR THRUST BEARING INSTALLATION

A) For installation of thrust bearings on VSG and VSSG units:

1) Install bearings (126) in the housing so the bearings are face to face.

The larger sides of the inner races are placed together. A light application of clean compressor lubricating oil should be used to ease the installation of the bearings into the housing.

2) Center the bearing retainer ring on housing, use Loctite® 242-thread locker and evenly tighten the bolts to the recommended torque value.

3) For installation of the bearing housing and the setting of the gate rotor blade clearance, refer to section **INSTALLATION (All VSG Models).**

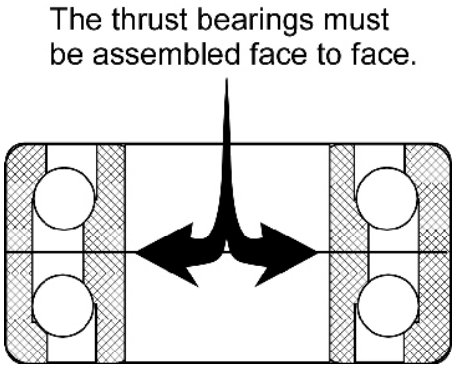
B) For installation of thrust bearings on VSG 301-701 units:

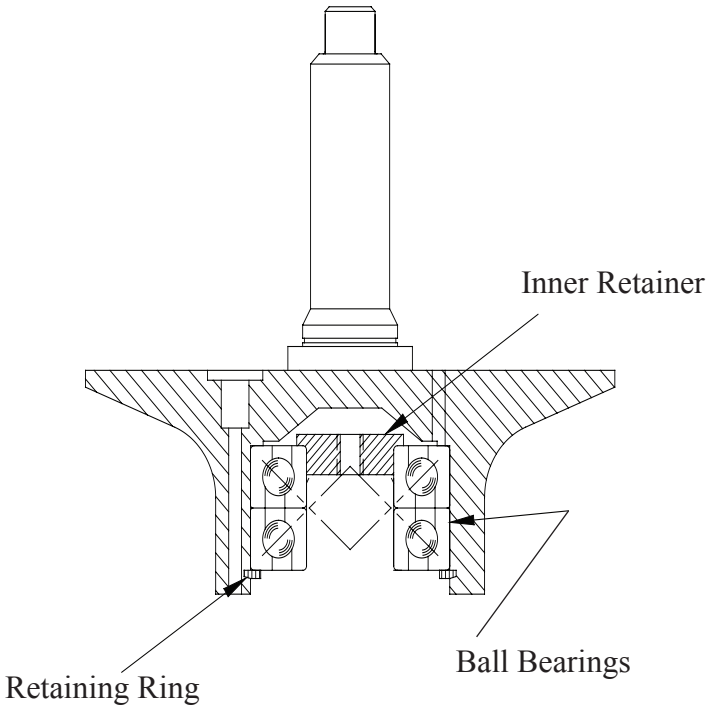
1) Install retainer in the back of the inner race of one of the thrust bearings. The back of the inner race is the narrower of the two sides.

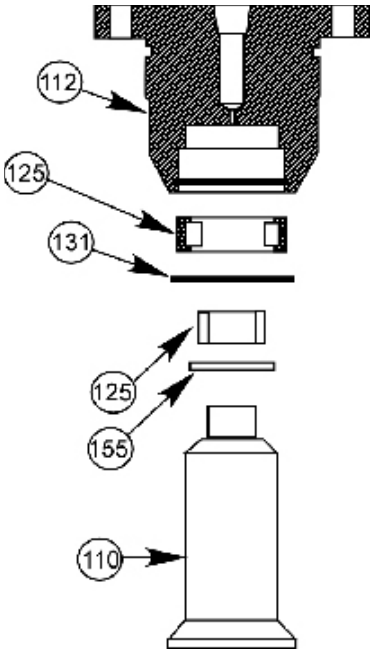
2) The bearing with the retainer should be placed in the housing first, retainer towards the support. Install the second bearing. The bearings should be positioned face to face. This means that the larger sides of the inner races are placed together. A light application of clean compressor lubricating oil should be used to ease the installation of the bearings into the gate rotor support.

3) Install the bearing retaining snap ring.

4) For installation of the bearing housing and the setting of the gate rotor blade clearance, refer to section **INSTALLATION (All VSG Models).**







GATE ROTOR ROLLER BEARING REMOVAL

A) Refer to section **REMOVAL (All VSG)** for removal of the gate rotor bearing housings and gate rotor supports.

B) Remove the snap ring (131), which retains the roller bearing in the bearing housing.

C) Remove the roller bearing (125) from the bearing housing (112).

D) Use a bearing puller to remove the roller bearing race (125) from the gate rotor support (110).

GATE ROTOR ROLLER BEARING INSTALLATION

A) Match up the part numbers on the inner race to the part numbers outer race. Press the bearing race (numbers visible) onto the gate rotor support.

B) Install the outer bearing into the bearing housing so the numbers match the numbers on the inner race. Install the snap ring retainer in the housing. The bevel on the snap ring must face away from the roller bearing.

C) For installation of the bearing housing, refer to section **INSTALLATION (All VSG Models).**

COMPRESSOR SHAFT SEAL REPLACEMENT

COMPRESSOR SHAFT SEAL REMOVAL

A) Prepare the compressor for servicing as outlined in section **REMOVAL (All VSG) .**

B) Remove bolts (281) holding the shaft seal cover (218). Insert two of the bolts into the threaded jacking holes to assist in removing the cover. There will be a small amount of oil drainage as the cover is removed.

C) Remove the rotating portion of the shaft seal (219C).

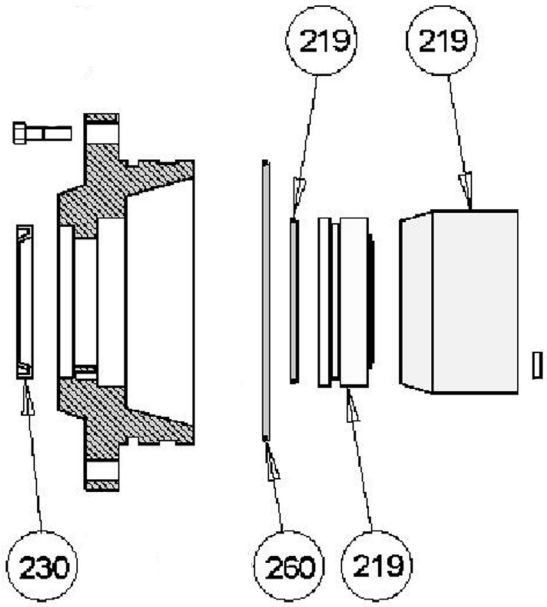
D) Remove oil seal (230) from cover.

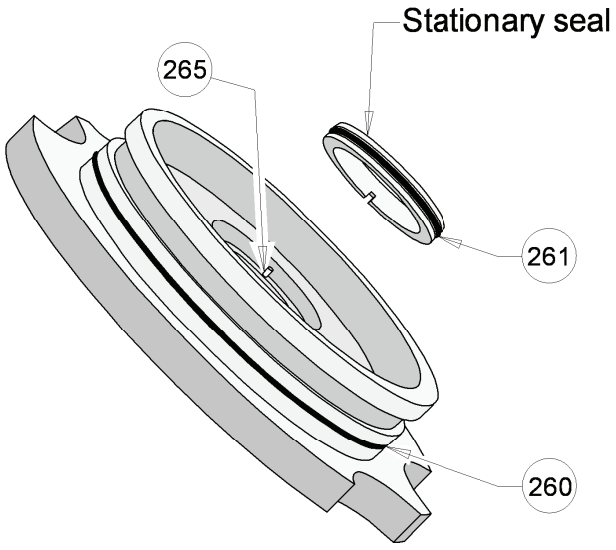
E) Remove the stationary portion of the shaft seal (219B) from the seal cover using a brass drift and hammer to tap it out from the back side of the seal cover.

Seal with stationary mirror face (219B) and rotating carbon face (219C).

Seal with stationary carbon face (219B) and rotating mirror face (219C).

Current Shaft Seal and for all Replacement.





COMPRESSOR SEAL INSTALLATION

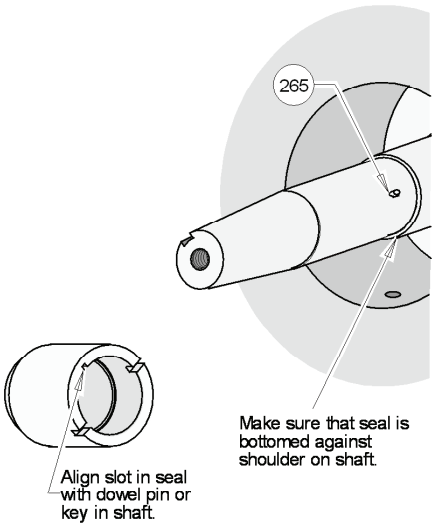
NOTE:

When replacing the stationary members of the seal on the VSSG 291 thru VSSG 601 the roll pin in the cover is used only with the seal assembly having a stationary mirror face. If a seal assembly with a stationary carbon face is installed, the roll pin must be removed.

A) Install new oil seal in cover.

CAUTION

Care must be taken when handling the shaft seal and mirror face so it is not damaged. Do not touch the carbon or mirror face as body oil and sweat will cause the mirror face to corrode.



B) To install the carbon cartridge part of the seal in the seal cover; clean the seal cover, remove protective plastic from the carbon cartridge, ***do not*** wipe or touch the carbon face. Lubricate the sealing O-ring with clean compressor lubricating oil. If applicable, align the hole on the back of the carbon cartridge with the dowel pin in the seal cover. Install cartridge using seal installation tool or similar (see tool lists).

C) Wipe clean, the compressor input shaft and the shaft seal cavity in the compressor housing. Apply clean compressor oil to the shaft seal seating area on input shaft.

D) Lubricate the inside area of the rotating seal with clean compressor lubricating oil, ***do not*** wipe or touch the face of the rotating portion of the seal. Align the slot in the rotating seal with the drive pin on the compressor input shaft. Carefully push the seal on, holding onto the outside area of the seal until the seal seats against the

shoulder on the input shaft. Make sure the seal is seated against the shoulder. If the seal is not fully seated against the shoulder, the shaft seal carbon will be damaged when the seal cover is installed.

Maintenance Suggestion:

A spray bottle filled with clean compressor oil may be used to lubricate the faces of the seals without touching the seal.

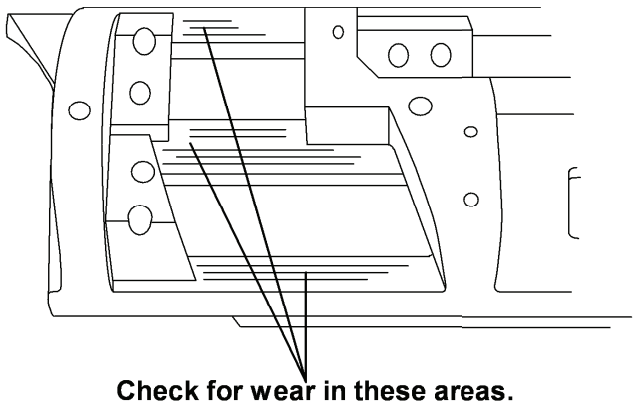
E) Install a new O-ring on the seal cover, making sure the O-ring is placed in the O-ring groove and not the oil gallery groove. Lubricate both seal faces with clean compressor lubricating oil.

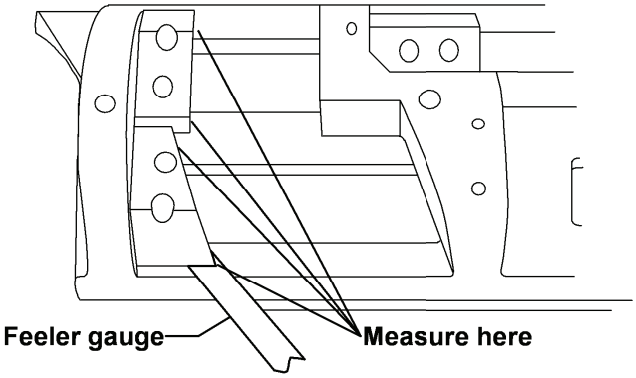
F) Carefully install the seal cover on the compressor shaft, evenly tightening the bolts to the recommended torque values.

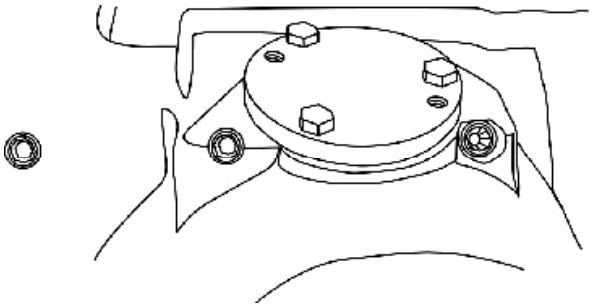
G) Install the coupling and coupling guard. The unit can then be evacuated and leak checked.

MAIN ROTOR ASSEMBLY

Due to the procedures and tools involved in the disassembly and reassembly, the main rotor assembly must be performed by qualified individuals. Please consult the factory if maintenance is required.







INSPECTION OF SLIDE VALVE ASSEMBLIES IN THE COMPRESSOR

Prepare the compressor for servicing.

A) Remove the gate rotor access covers. Using a mirror and flashlight, visually inspect the slide valve carriage through the gas bypass opening. Look for any significant signs of wear on the slide valve carriage.

B) To check the clearance of the slide valve clamps, the gate rotor support must be removed. Refer to removal of the gate rotor support.

C) Using a feeler gauge, inspect the clearance between capacity and volume slide valve clamps and slide valve carriage through the gas bypass opening. The clearance should be less than 0.002”.

D) If the slide valves are worn in excess of the tolerances, the factory should be contacted.

REMOVAL SLIDE VALVE CARRIAGE ASSEMBLIES

A) Prepare the compressor for servicing.

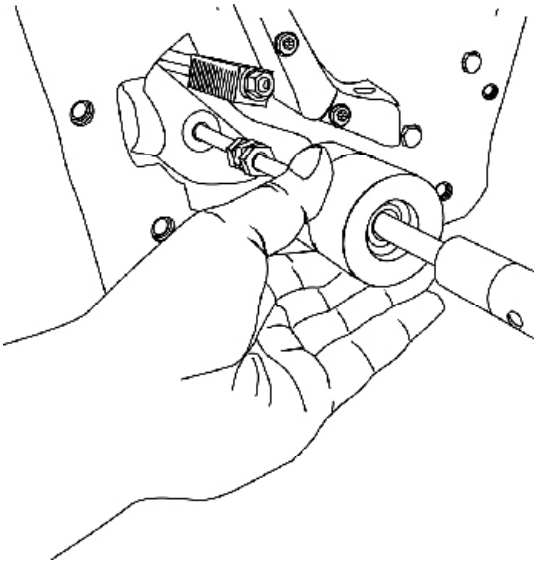
B) If only one of the slide valve carriages is removed only the corresponding gate rotor support needs to be removed. If both carriages are removed both gate rotors must be removed. Remove the gate rotor assemblies.

C) Remove the capacity and volume actuators. Remove the discharge manifold, capacity and volume cross shafts and the slide valve racks.

D) Locate and remove the socket head plugs above the slide valve carriage attachment bolts. Remove the bolts located under the plugs.

E) The slide valve carriage may now be removed. On newer carriages there is a threaded hole in the back of the slide valve carriage to aid in its removal. Use a threaded tip slide hammer to aid in the removal of the carriage.

Note: Slide Valves may be re-positioned to aid in removal of assembly.

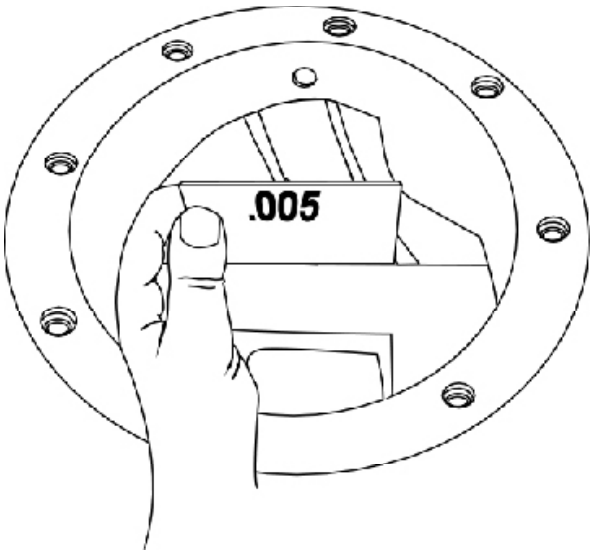


INSTALLATION OF SLIDE VALVE CARRIAGE ASSEMBLIES

A) Position the slide valves to the center of the carriage. Place the slide valve assembly in the bore of frame and use the slide hammer to slowly tap the carriage into position. Re-positioning slide valves once inside bore may aid installation. Adjust the carriage so that the 3-holes line up.

B) Install the 3 socket head cap screws with new Nord-Lock washers beneath the heads, but do not tighten them.

C) Work a piece of 0.005"shim stock between the slide valves and the main rotor to help position the carriage.



D) Tighten, to the correct torque the hold down bolts to secure the carriage in the frame. The edges of the slide valves themselves should be at or slightly below the main rotor bore.

E) Re- Install the capacity and volume slide valve cross shafts, slide valve racks and discharge manifold.

F) Re-install the gate rotor assemblies.

COMMAND SHAFT ASSEMBLY REMOVAL

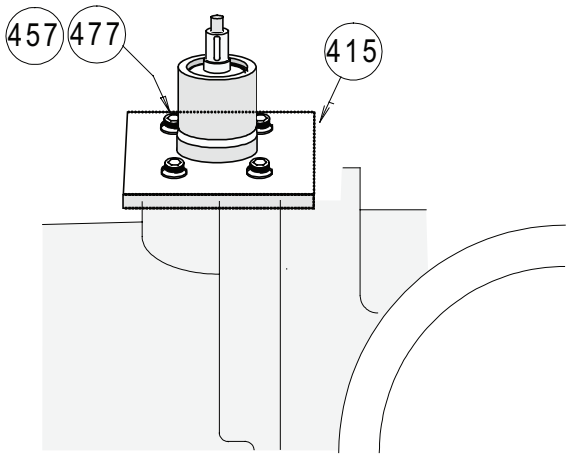
The following steps can be used to remove or install either the capacity or volume command shaft assemblies.

A) Prepare the compressor for servicing.

B) Follow the appropriate instructions to remove control actuator. .

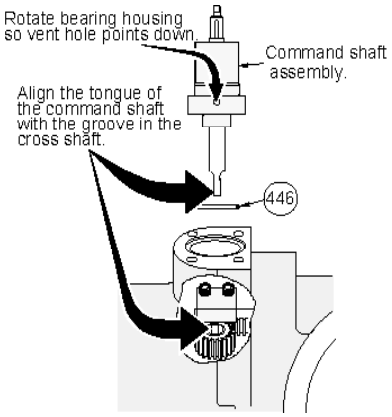
C) Remove four socket head cap screws (457) and Nord-Lock washers (477) securing mounting plate (415) to manifold.

D) The command shaft and mounting plate may now be removed from the compressor.



COMMAND SHAFT ASSEMBLY INSTALLATION

A) Install the command shaft assembly with a new o-ring (446) on the manifold. Make sure that the command shaft tongue is engaged in the cross shaft slot. Rotate the bearing housing so the vent holes point down, this will prevent water and dust from entering the vents.



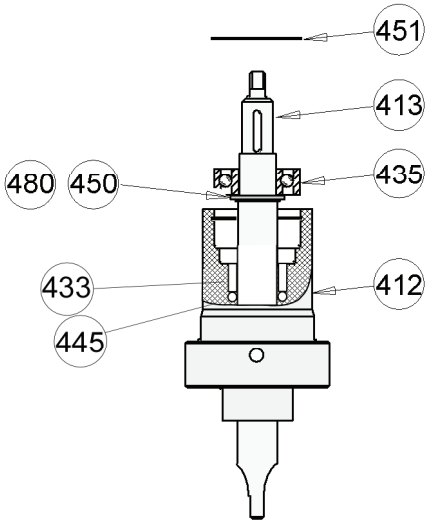
B) Install the actuator mounting plate with the four socket head cap screws and Nord-Lock washers securing it with proper torque.

C) The unit can now be leak checked.

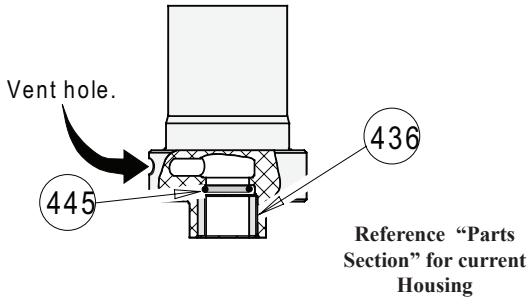
COMMAND SHAFT BEARING AND O-RING SEAL REPLACEMENT

A) Remove command shaft assembly.

B) Remove snap ring retainer (451) from command shaft housing (412). Push the command shaft assembly out of the housing.



C) The command shaft bearing (435) is a press fit on the command shaft (413). Remove the command shaft bearing with a suitable press.



D) Remove the O-ring seal (445) from the command shaft housing. The command shaft bushing (433 and 436) might have to be removed to gain access to o-rings. Replace bushing if the bore is deeply scored or excessively worn.

COMMAND SHAFT BEARING AND O-RING SEAL REASSEMBLY

A) Install new O-ring seal in housing and lubricate the O-ring with clean compressor oil. A vent hole is provided in the command shaft bearing housing to allow any gas and oil that may leak past the O-ring seal to vent to atmosphere and not into the slide valve motor housing. Install snap ring retainer and washer on the command shaft.

B) Remove any burrs from the command shaft to prevent damage to the O-ring when assembling. Press the command shaft bearing onto the command shaft. Insert the command shaft into the housing applying pressure on outer race of bearing. Make sure the bearing is fully seated in the command shaft housing. Install the snap ring retainer in the command shaft housing.

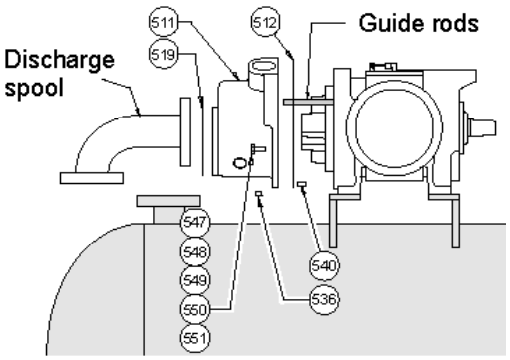
C) Install command shaft assembly.

DISCHARGE MANIFOLD REMOVAL

A) Remove both control actuators and command shaft assemblies.

B) On VSG751-2101 and VSSG 291-601 compressors, remove the discharge spool between the manifold and separator. Remove one bolt from each side of the discharge manifold and install (2) guide rods approximately 6" long, to support the manifold. Remove the remaining bolts (note length and location of bolts) and take off the discharge manifold.

Note: Mainfold has dowel pins to locate it on the compressor housing. Therefore, remove manifold straight back approximately 1" as not to break dowel pins.



NOTE:

When removing the discharge manifold on VSG 301-701 compressor the compressor must be properly supported to keep the compressor from moving when the manifold is removed.

C) On VSG 301-701 compressors unbolt the discharge flange from the discharge manifold.

D) Remove one bolt from each side of the discharge manifold and install (2) guide rods approximately 6" long, to support the manifold. Remove the remaining bolts (note length and location of bolts) and take off the discharge manifold.

DISCHARGE MANIFOLD INSTALLATION

A) Install (2) guide rods to position the discharge manifold. Install a new manifold gasket and the discharge manifold. Install the dowel pins and bolts, tighten manifold bolts to the recommended torque value.

B) On VSG 751-2101 and VSSG 291-601 compressors install the discharge spool or elbow between the discharge manifold and oil separator with new gaskets. When installing the discharge elbow tighten the bolts to the correct torque on the manifold flange first before tightening the separator flange bolts. Install the drain plug in the bottom of the discharge manifold.

C) On VSG 301-701 compressors install the bolts in the discharge flange. Install the drain plug in the bottom of the discharge manifold.

D) Install both command shaft assemblies and control actuators.

SLIDE VALVE GEAR AND RACK INSPECTION

A) Remove the discharge manifold.

B) Check rack to rack clamp and rack clamp spacer clearance on all four slide valves.

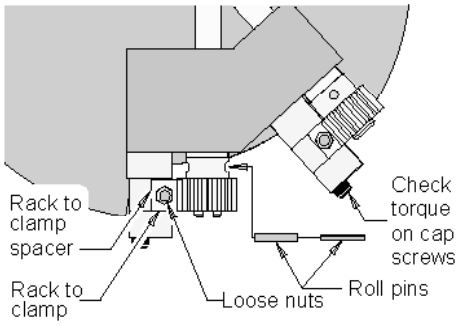
TABLE 4.1
RACK CLEARANCE VALUES

MEASUREMENT	CLEARANCE
Rack to clamp.	0.005 to 0.010”
Rack to clamp spacer.	0.003 to 0.005”

C) Check torque of socket heat cap screws.

D) Check for excessive movement between the slide valve rack shafts and the rack. The jam nuts on the end of the slide valve rack shaft should be tight.

E) Check for loose or broken roll pins in gears.



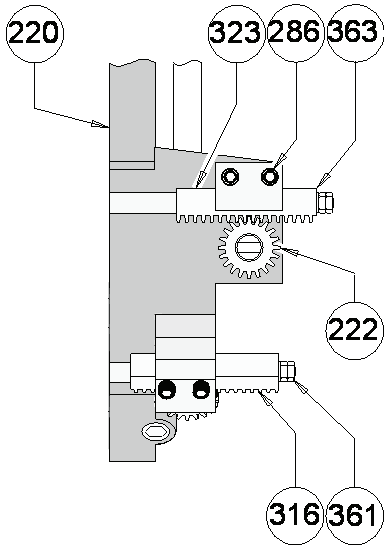
F) Look for any excessive wear on all moving parts and replace the worn parts.

G) Reassemble the manifold and discharge elbow.

REMOVAL OF CAPACITY OR VOLUME CROSS SHAFTS

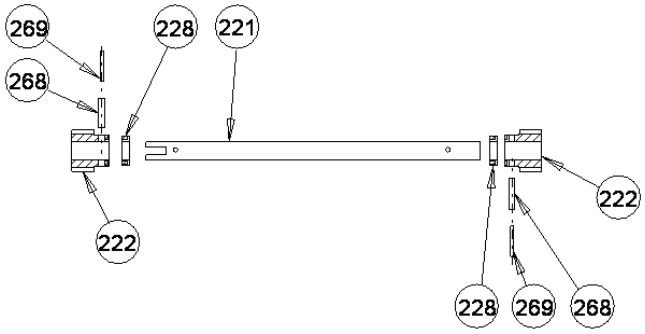
A) Remove the discharge manifold.

B) To remove the capacity or volume ratio slide valve racks, remove the two jam nuts and lock washers (361) securing the rack (316) to the slide valve shafts. The racks can now be pulled off the slide valve shafts. Repeat the procedure for the remaining pair of slide valve racks.

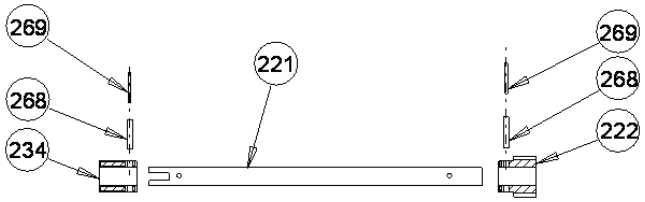


C) To remove the cross shafts, remove socket head bolts, clamp and spacers from both sides.

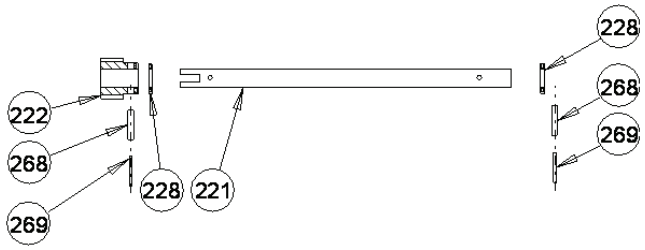
VSG 751-2101 compressors cross shafts.



VSSG 291-601 compressors cross shafts
Volume control cross shaft.



Capacity control cross shaft.

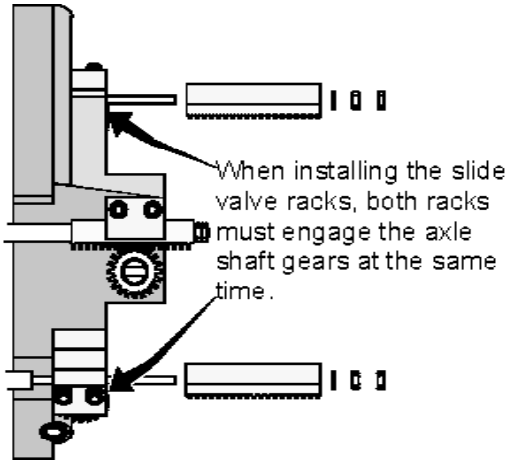


D) Drive the roll pins from pinion gear from one side. Remove pinion gear. Slide the cross shaft with the remaining pinion gear or spacers out of the opposite side. Repeat the procedure for the remaining cross shaft.

INSTALLATION OF CAPACITY OR VOLUME CROSS SHAFTS

A) To reassemble either set of capacity or volume ratio slide valve racks, install the cross shaft with the pinion gear onto the back plate, place the remaining pinion gear on the shaft and drive in the roll pins. Install clamps, spacers and bolts on both sides. Tighten the bolts to the recommended torque values.

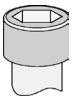
B) The slide valve sets must be synchronized on VSG 751-2101 and dual gate VSG 301-701 units. Both slide valve racks for either the volume ratio or capacity slide valves must engage the cross shaft gears at the same time. Push the racks all the way towards the suction end of the compressor until they stop. Install washers and jam nuts on the slide valve shafts. Repeat the procedure for the remaining set of slide valve racks.



C) Install (2) guide rods to position the discharge manifold. Install a new manifold gasket and the discharge manifold. Install the dowel pins and bolts, tighten manifold bolts to the recommended torque value.

D) On VSG 751-2101 and VSSG 291-601 and VSG 301-701 compressors install the discharge.

TORQUE SPECIFICATIONS (ALL UNITS IN FT.-LBS)

TYPE BOLT	HEAD MARKINGS	OUTSIDE DIAMETER OF BOLT SHANK							
		1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"
SAE GRADE 2		6	12	20	32	47	69	96	155
SAE GRADE 5		10	19	33	54	78	114	154	257
SAE GRADE 8		14	29	47	78	119	169	230	380
SOCKET HEAD CAP SCREW		16	33	54	84	125	180	250	400

TORQUE SPECIFICATION FOR 17-4 STAINLESS STEEL FASTENERS (FT-LBS)

TYPE	¼"	5/16"	3/8"	7/16"	½"	9/16"	5/8"	¾"
HEX & SOCKET HEAD CAP SCREW	8	14	25	40	60	101	137	245
NUT	8							

NOTE: CONTINUE USE OF RED LOCTITE ON CURRENTLY APPLIED LOCATIONS. USE BLUE LOCTITE ON ALL REMAINING LOCATIONS.

USING A TORQUE WRENCH CORRECTLY

TORQUE WRENCHES

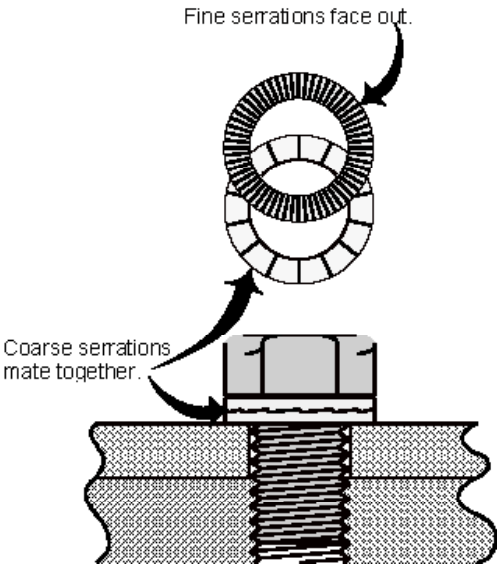
USING A TORQUE WRENCH CORRECTLY INVOLVES FOUR PRIMARY CONCERNS:

A. A smooth even pull to the break point is required. Jerking the wrench can cause the pivot point to break early leaving the bolt at a torque value lower then required. Not stopping when the break point is reached results in an over torque condition.

B. When more than one bolt holds two surfaces together there is normally a sequence that should be used to bring the surfaces together in an even manner. Generally bolting is tightened incrementally in a diametrically staggered pattern. Some maintenance manuals specify a tightening scheme. If so, the manual scheme shall be followed. Just starting on one side and tightening in a circle can cause the part to warp, crack, or leak.

C. In some cases threads are required to be lubricated prior to tightening the bolt/nut. Whether a lubricant is used or not has considerable impact on the amount of torque required to achieve the proper preload in the bolt/stud. Use a lubricant, if required, or not if so specified.

D. Unlike a ratchet wrench a torque wrench is a calibrated instrument that requires care. Recalibration is required periodically to maintain accuracy. If you need to remove a bolt/nut do not use the torque wrench. The clockwise/counterclockwise switch is for tightening right hand or left hand threads not for loosening a fastener. Store the torque wrench in a location where it will not be bumped around.



A. The Nord-Lock® lock washer sets are used in many areas in both the VSG & VSSG screw compressors that require a vibration proof lock washer.

B. The lock washer set is assembled so the course serrations that resemble ramps are mated together.

C. Once the lock washer set is tightened down, it takes more force to loosen the bolt that it did to tighten it. This is caused by the washers riding up the opposing ramps.

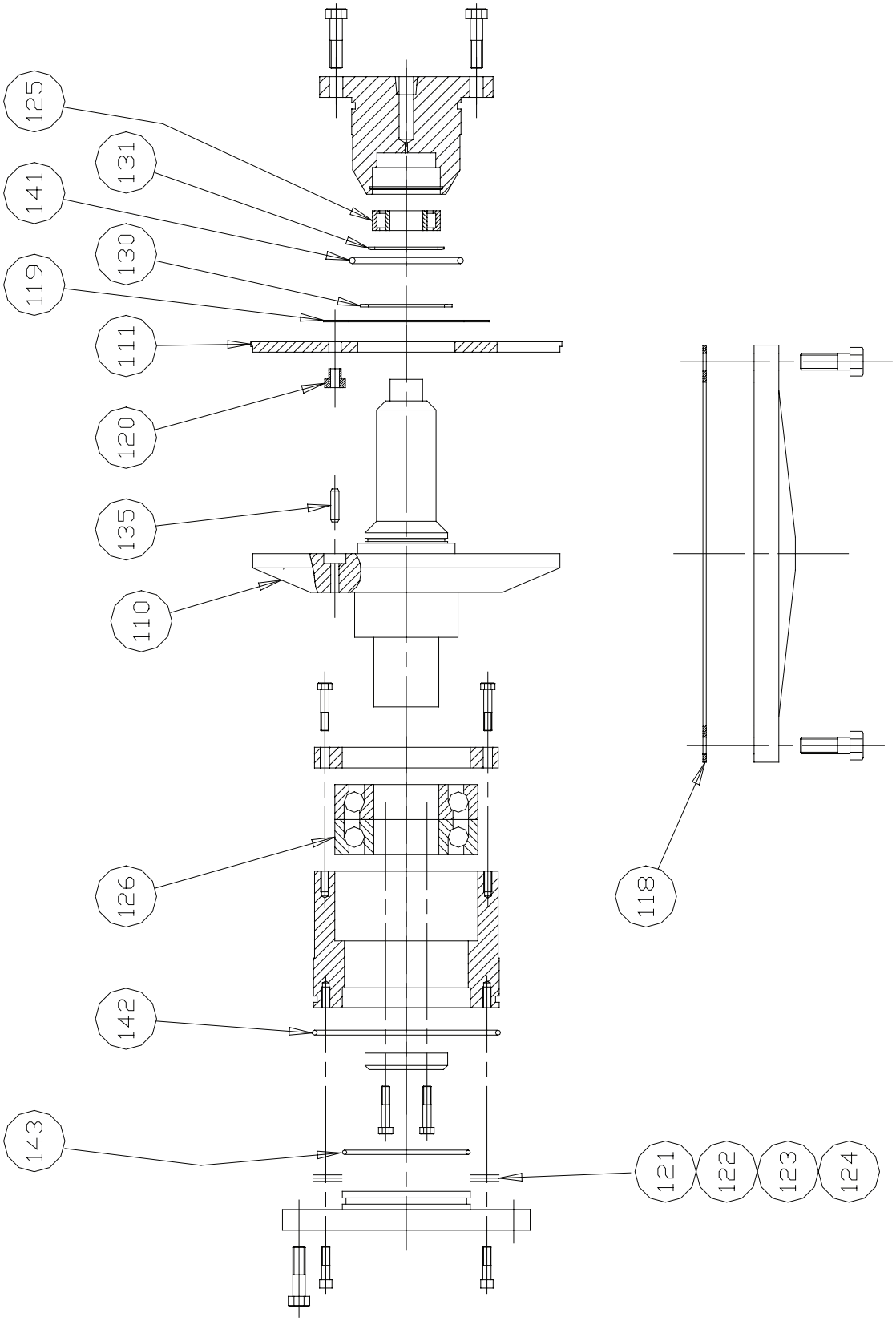
Recommended
Spare Parts List

Refer to the Custom Manual
Spare Parts Section for Specific Applications

Please have your Model # and Sales Order # available when ordering.

These are found on the compressor's Name Plate.

Gate Rotor


125
131
141
130
119
111
120
135
110
126
142
143
118
121
122
123
124

Gate Rotor

ITEM	DESCRIPTION	MODEL NUMBER VSSG 451 QTY	VSSG 451 VPN	VSSG 601 QTY	VSSG 601 VPN
	GATE ROTOR BLADE AND BEARING REPLACEMENT KIT, 111, 118, 120A, 120B, 121, 122, 123, 124, 125, 126, 130, 131, 141, 142 & 143.	2	KT712A	2	KT712B
	GATE ROTOR BLADE REPLACE KIT, 111, 118, 120A, 120B, 121, 122, 123, 124, 130, 141, 142 & 143.	2	KT713A	2	KT713B
102	GATE ROTOR SUPPORT ASSEMBLY 100, 111, 120B, 119 & 130.	2	A25161BB	2	A25161BA
105	GATE ROTOR GASKET SET 118, 141, 142 & 143.	2	A25164B	2	A25164B
106	SHIM PACK SET (2) 121, (2) 122, (1) 123, (1) 124.	2	A25165B	2	A25165B
110	SUPPORT.	2	25606A	2	25520A
111	GATE ROTOR.	2	25557A	2	25534A
112	SMALL BEARING HOUSING.	2	25518A	2	25518A
113	LARGE BEARING HOUSING.	2	25517A	2	25517A
114	RETAINER.	2	25008A	2	25008A
115	RETAINER.	2	25009A	2	25009A
116	BALL BEARING COVER.	2	25258A	2	25258A
117	GATE ROTOR COVER.	2	25519A	2	25519A
118	GATE ROTOR COVER GASKET.	2	25259A	2	25259A
119	WASHER.	2	25007A	2	25007A
120A	BUSHING, SMALL DOWEL PIN.	2	25006A	2	25006A
120B	BUSHING, LARGE DOWEL PIN.	2	25760A	2	25760A
121	SHIM 0.002”.	ar	25010AA	ar	25010AA
122	SHIM 0.003”.	ar	25010AB	ar	25010AB
123	SHIM 0.005”.	ar	25010AC	ar	25010AC
124	SHIM 0.010”.	ar	25010AD	ar	25010AD
125	ROLLER BEARING.	2	2864B	2	2864B
126	BALL BEARING.	4	2865B	4	2865B
130	RETAINING RING.	2	2866A	2	2866A
131	RETAINING RING.	2	2867A	2	2867A
135A	DOWEL PIN, SM, 0.250” O.D..	2	2868B	2	2868B
135B	DOWEL PIN, LG, 0.4375” O.D..	2	25910A	2	25910A
141	O-RING ROLLER BRG HSG.	2	2176M	2	2176M
142	O-RING BALL BRG HSG.	2	2176R	2	2176R
143	O-RING BRG HSG COVER.	2	2176N	2	2176N
150	HEX HEAD CAP SCREW.	12	2796AJ	12	2796AJ
151	HEX HEAD CAP SCREW.	6	2796B	6	2796B
152	HEX HEAD CAP SCREW.	40	2796CJ	40	2796CJ
153	HEX HEAD CAP SCREW.	32	2796E	32	2796E
160	SOCKET HEAD CAP SCREW.	12	2795E	12	2795E

NOTE: ar = As Required

Gate Rotor

ITEM	DESCRIPTION	VSG 751		VSG 901		VSG 1051		VSG 1201	
		QTY	VPN	QTY	VPN	QTY	VPN	QTY	VPN
	GATE ROTOR BLADE AND BEARING REPLACEMENT KIT, 111, 118, 120A, 120B, 121, 122, 123, 124, 125, 126, 130,131, 141, 142 & 143.	2	KT712C	2	KT712D	2	KT712E	2	KT712F
	GATE ROTOR BLADE REPLACE KIT, 111, 118, 120A, 120B, 121, 122, 123, 124, 130, 141, 142 & 143.	2	KT713C	2	KT713D	2	KT713E	2	KT713F
102	GATE ROTOR SUPPORT ASSEMBLY 100, 111, 120B, 119 &130	2	A25161CB	2	A25161CA	2	A25161DB	2	A25161DA
105	GATE ROTOR GASKET SET 118, 141, 142 & 143.	2	A25164C	2	A25164C	2	A25164D	2	A25164D
	SHIM PACK SET (2) 121, (2) 122, (1) 123, (1) 124.	2	A25165C	2	A25165C	2	A25165C	2	A25165C
110	SUPPORT.	2	25612A	2	25553A	2	25614A	2	25587A
111	GATE ROTOR.	2	25608A	2	25554A	2	25610A	2	25588A
118	GATE ROTOR COVER GASKET.	2	25088A	2	25088A	2	25132A	2	25132A
119	WASHER.	2	25086A	2	25086A	2	25086A	2	25086A
120A	BUSHING, SMALL DOWEL PIN.	2	25087A	2	25087A	2	25104A	2	25104A
120B	BUSHING, LARGE DOWEL PIN.	2	25760B	2	25760B	2	25760B	2	25760B
121*	SHIM 0.002”.	ar	25089AA	ar	25089AA	ar	25089AA	ar	25089AA
122*	SHIM 0.003”.	ar	25089AB	ar	25089AB	ar	25089AB	ar	25089AB
123*	SHIM 0.005”.	ar	25089AC	ar	25089AC	ar	25089AC	ar	25089AC
124*	SHIM 0.010”.	ar	25089AD	ar	25089AD	ar	25089AD	ar	25089AD
125	ROLLER BEARING.	2	2864C	2	2864C	2	2864G	2	2864G
126	BALL BEARING.	4	2865A	4	2865A	4	2865A	4	2865A
130	RETAINING RING.	2	2866B	2	2866B	2	2866B	2	2866B
131	RETAINING RING.	2	2867E	2	2867E	2	2867L	2	2867L
135A	DOWEL PIN, SMALL, 0.3125” O.D..	2	2868F	2	2868F	2	2868H	2	2868H
135B	DOWEL PIN, LARGE, 0.4375” O.D..	2	25910B	2	25910B	2	25910B	2	25910B
141	O-RING ROLLER BRG HSG.	2	2176N	2	2176N	2	2176AJ	2	2176AJ
142	O-RING BALL BRG HSG.	2	2176V	2	2176V	2	2176AM	2	2176AM
143	O-RING BRG HSG COVER.	2	2176U	2	2176U	2	2176U	2	2176U

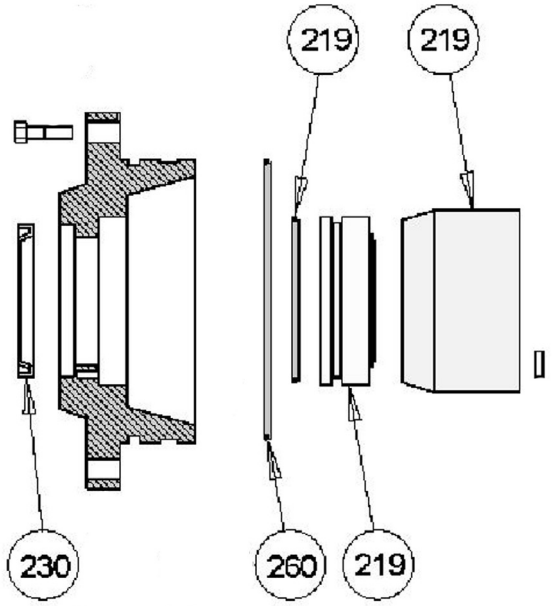
ar = As Required

Gate Rotor

ITEM	DESCRIPTION	VSG 1551		VSG1851		VSG 2101	
		QTY	VPN	QTY	VPN	QTY	VPN
	GATE ROTOR BLADE AND BEARING REPLACEMENT KIT, 111, 118, 120A, 120B, 121, 122, 123, 124, 125, 126, 130, 131, 141, 142 & 143.	2	KT712L	2	KT712M	2	KT712K
	GATE ROTOR BLADE REPLACEMENT KIT, 111, 118, 120A, 120B, 121, 122, 123, 124, 130, 141, 142 & 143.	2	KT713G	2	KT713H	2	KT713L
101	GATE ROTOR ASSEMBLY 111 & 120.	2	A25160EB	2	A25160EA	2	A25160EA
102	GATE ROTOR SUPPORT ASSEMBLY 100, 111, 120B, 119 &130.	2	A25161EB	2	A25161EA	2	A25161EL
104	SHIM, 350MM GATE ROTOR BALL BEARING (VSS)	2	25977U	2	25977U	2	25977U
105	GATE ROTOR GASKET SET 118, 141, 142 & 143.	2	A25164E	2	A25164E	2	A25164E
	SHIM PACK SET (2) 121, (2) 122, (1) 123, (1) 124.	2	A25165E	2	A25165E	2	A25165E
110	SUPPORT.	2	25687A	2	25665A	2	25495D
111	GATE ROTOR.	2	25647A	2	25645A	2	25744D
112	SMALL BEARING HOUSING.	2	26507A	2	26507A	2	26507A
113	LARGE BEARING HOUSING.	2	26506A	2	26506A	2	26506A
114	RETAINER.	2	25141A	2	25141A	2	25141A
115	RETAINER.	2	25789A	2	25789A	2	25789A
116	BALL BEARING COVER.	2	25351A	2	25351A	2	25351A
117	GATE ROTOR COVER.	2	26508B	2	26508B	2	26508B
118	GATE ROTOR COVER GASKET.	2	26509A	2	26509A	2	26509A
119	WASHER.	2	25788A	2	25788A	2	25788A
120B	BUSHING, LARGE DOWEL PIN.	2	25760C	2	25760C	2	25760C
121*	SHIM 0.002”.	ar	25791AA	ar	25791AA	ar	25791AA
122*	SHIM 0.003”.	ar	25791AB	ar	25791AB	ar	25791AB
123*	SHIM 0.005”.	ar	25791AC	ar	25791AC	ar	25791AC
124*	SHIM 0.010”.	ar	25791AD	ar	25791AD	ar	25791AD
125	ROLLER BEARING.	2	2864K	2	2864K	2	2864K
126	BALL BEARING.	4	2865K	4	2865K	4	2865K
130	RETAINING RING.	2	2866G	2	2866G	2	2866G
131	RETAINING RING.	2	2867R	2	2867R	2	2867R
135B	DOWEL PIN, LARGE, 0.500” O.D..	2	25910C	2	25910C	2	25910C
141	O-RING ROLLER BRG HSG.	2	2176U	2	2176U	2	2176U
142	O-RING BALL BRG HSG.	2	2176BD	2	2176BD	2	2176BD
143	O-RING BRG HSG COVER.	2	2176P	2	2176P	2	2176P
150	HEX HEAD CAP SCREW.	12	2796CJ	12	2796CJ	12	2796CJ
151	HEX HEAD CAP SCREW.	8	2796N	8	2796N	8	2796N
152	HEX HEAD CAP SCREW.	32	2796CJ	32	2796CJ	32	2796CJ
153	HEX HEAD CAP SCREW.	44	2796R	44	2796R	44	2796R
160	SOCKET HEAD CAP SCREW.	16	2795G	16	2795G	16	2795G

ar = As required

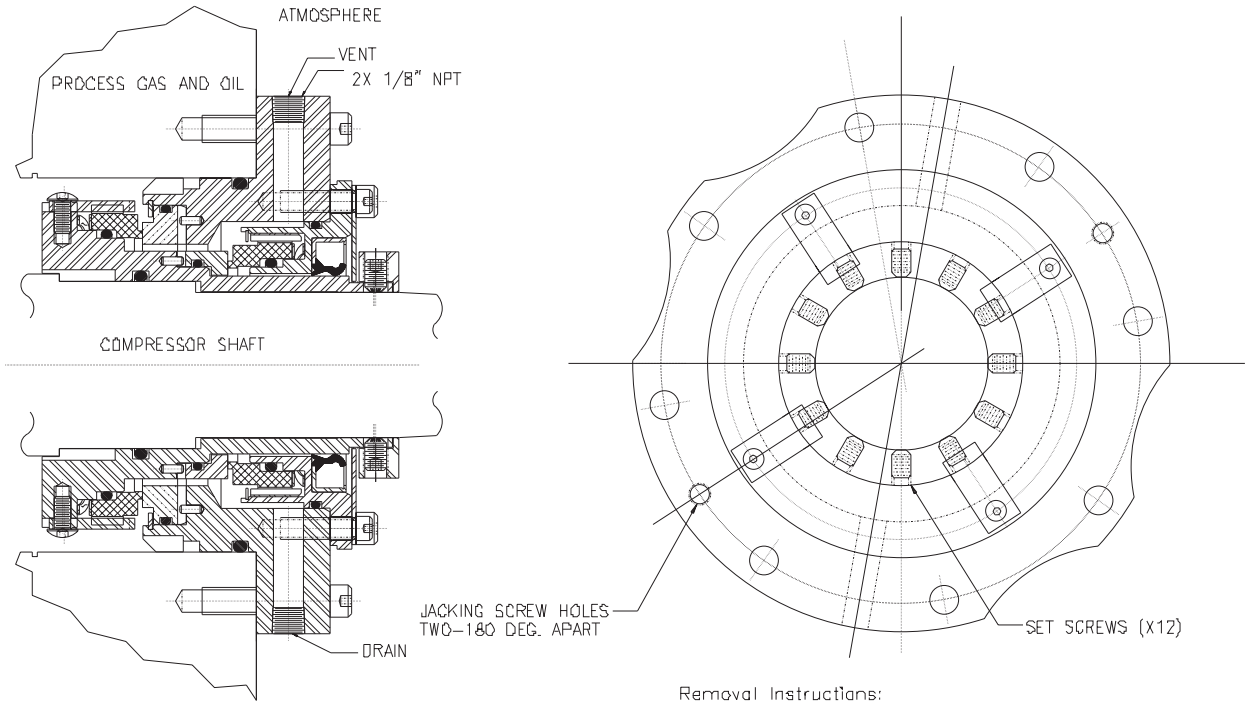
Shaft Seal



Shaft Seal With Stationary Carbon Face

ITEM	DESCRIPTION	MODEL NUMBER					
		VSSG 291-601		VSG 751-1201		VSG 1551 thru 2101	
		QTY	VPN	QTY	VPN	QTY	VPN
	SHAFT SEAL VITON KIT, 219, 260, 230	1	KT709AG	1	KT709BG	1	KT709CG
230	OIL SEAL.	1	25040A	1	25064A	1	2930B
260	O-RING.	1	2176F	1	2176AC	1	2176BH

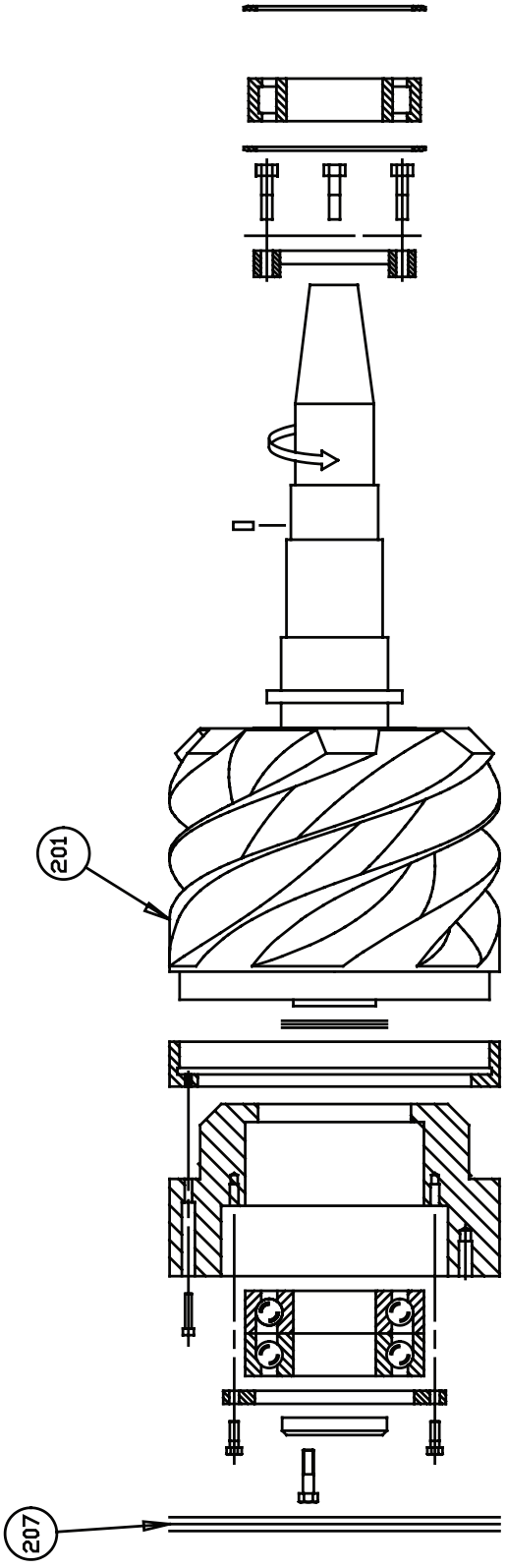
Tandem Shaft Seal



Removal Instructions:
1. Loosen all set screws
2. Remove bolts
3. Remove seal from compressor,(jacking locations are provided to help remove the seal)

PIPE VENT & DRAIN SEPARATELY USING MIN. 1/4" OD TUBING TO LOW PRESSURE COLLECTION POINTS

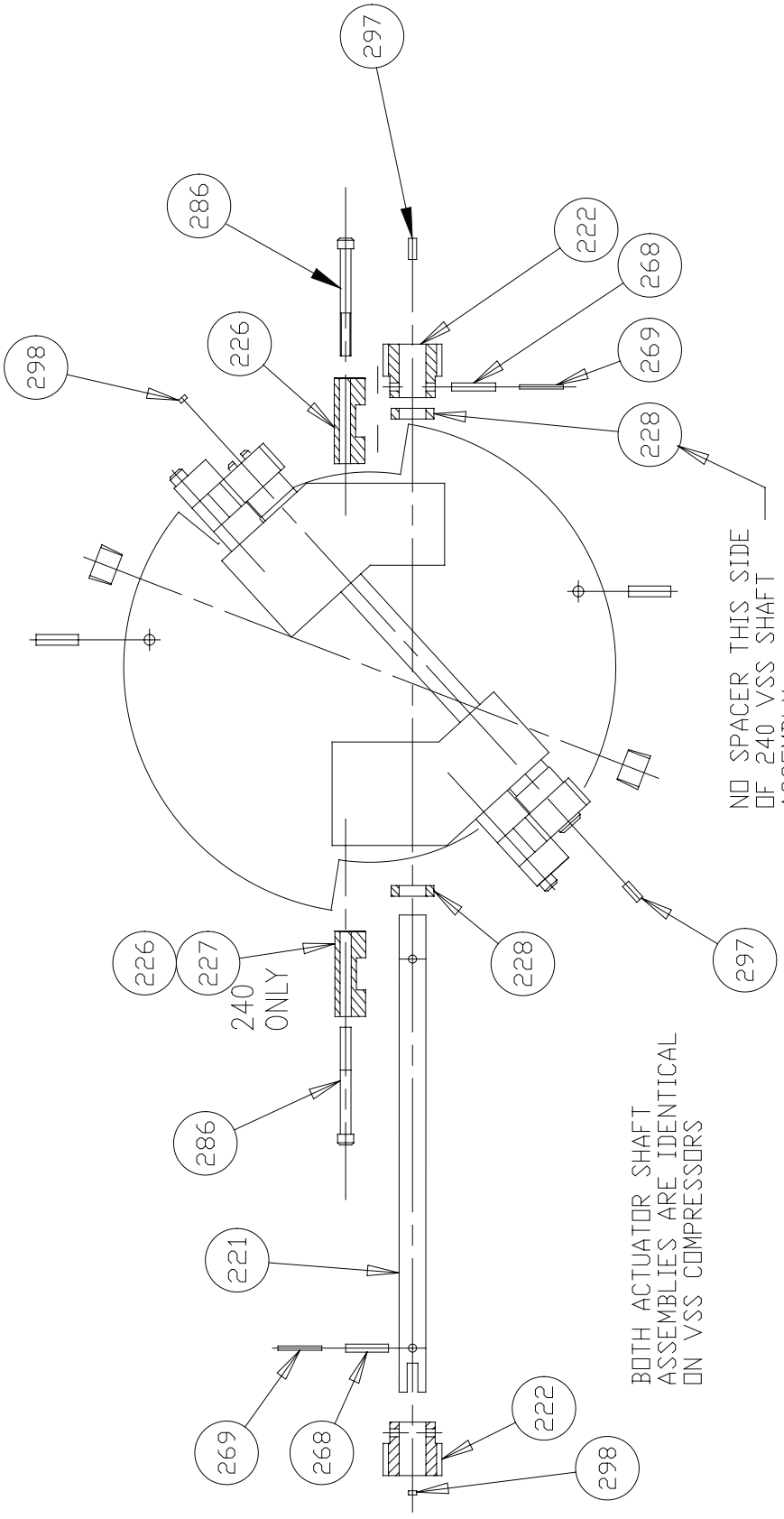
	DESCRIPTION	SHAFT DIAMETER					
		2.25"		2.5"		2.875"	
		QTY	VPN	QTY	VPN	QTY	VPN
	TANDEM SHAFT SEAL	1 1	25713A 25713B	1 1	25713A 25713B	1 1	25713A 25713B



Note: Endplate to frame O-Rings
See item 530

MODEL NUMBER																					
ITEM	DESCRIPTION	VSSG 451		VSSG 601		VSG 751		VSG 901		VSG 1051		VSG 1201		VSG 1551		VSG 1851		VSG 2101	
		QTY	PART#	QTY	PART#	QTY	PART#	QTY	PART#	QTY	PART#	QTY	PART#	QTY	PART#	QTY	PART#	QTY	PART#
201	ROTOR ASSY (DOES NOT INCLUDE SHIM PACK #207)	1	A25168BB	1	A25168BA	1	A25168CB	1	A25168CA	1	A25168DB	1	A25168DA	1	A25168EB	1	A25168AE	1	A25225EE
207	SHIM PACK	1	A25177B	1	A25177B	1	A25177C	1	A25177C	1	A25177D	1	A25177D	1	A25177E	1	A25177E	1	A25177E

Slide Valve Cross Shafts and End Plate



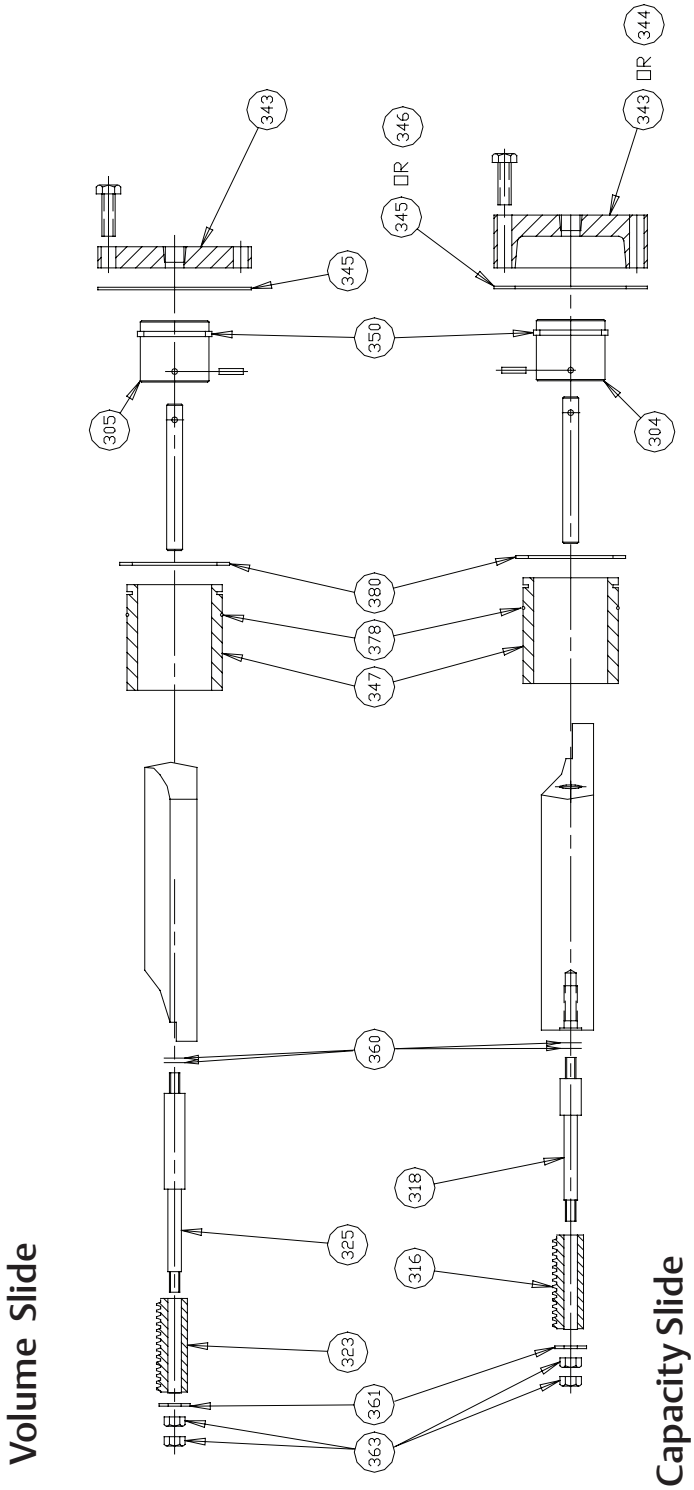
Slide Valve Cross Shafts and End Plate

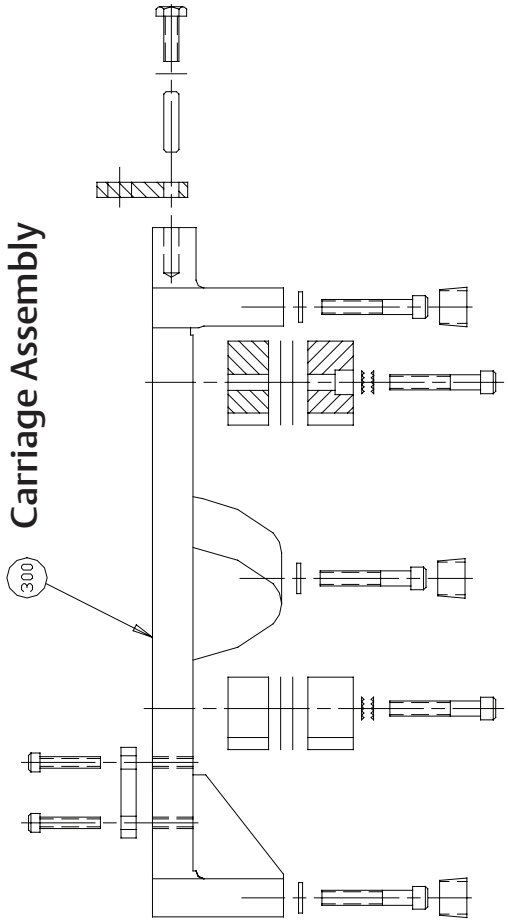
ITEM	DESCRIPTION	MODEL NUMBER VSSG 291-601	
		QTY	VPN
221	SHAFT.	2	25843A
222	GEAR.	4	25027A
226	RACK CLAMP.	2	25913A
227	RACK CLAMP.	2	25913B
228	SPACER.	2	25847A
268	EXPANSION PIN.	4	1193D
269	EXPANSION PIN.	4	2981AA
286	SOCKET HEAD CAP SCREW.	8	2795F
297	SET SCREW	2	2060J
298	SET SCREW	2	2060H

ITEM	DESCRIPTION	MODEL NUMBER			
		VSG 751 & VSG 901		VSG 1051 & VSG 1201	
		QTY	VPN	QTY	VPN
220	END PLATE	1	25543A	1	25593A
221	SHAFT.	2	25844A	2	25845A
222	GEAR.	4	25027A	4	25027A
226	RACK CLAMP.	4	25913C	4	25913C
228	SPACER.	4	25033C	4	25033C
267	DOWEL PIN.	2	2868B	2	2868B
268	EXPANSION PIN.	4	1193D	4	1193D
269	EXPANSION PIN.	4	2981AA	4	2981AA
270	PIPE PLUG.	2	2606E	2	2606E
286	SOCKET HEAD CAP SCREW.	8	2795F	8	2795F
297	SET SCREW	2	2060J	2	2060J
298	SET SCREW	2	2060H	2	2060H

ITEM	DESCRIPTION	MODEL NUMBER VSG 1551Thru VSG 2101	
		QTY	VPN
220	END PLATE	1	25661A
221	SHAFT.	2	25793A
222	GEAR.	4	25027A
226	RACK CLAMP.	4	25913C
228	SPACER.	4	25033C
267	DOWEL PIN.	2	2868B
268	EXPANSION PIN.	4	1193D
269	EXPANSION PIN.	4	2981AA
270	PIPE PLUG.	2	2606A
286	SOCKET HEAD CAP SCREW.	8	2795F
297	SET SCREW	2	2060J
298	SET SCREW	2	2060H

Slide Valve Carriage Assembly





Slide Valve Carriage Assembly

ITEM	DESCRIPTION	MODEL NUMBER- VSSG 291 Thru VSSG 601	
		QTY	VPN
300	CARRIAGE ASSEMBLY.	2	A25179B
304	CAPACITY PISTON 340, 341, 350 & 355	2	A25183B
305	VOLUME PISTON 340, 342, 350 & 355	2	A25184B
307	GASKET SET 345B.	2	A25200B
316	RACK.	2	25024A
323	RACK.	2	25023A
343A	COVER, SEPARATE VOL. & CAP.	4	25022A
343B	COVER, ONE PIECE CAST.	2	25399A
345A	GASKET, SEPARATE VOL. & CAP COVERS.	4	25021A
345B	GASKET, ONE PIECE CAST COVER.	2	25900A
350	PISTON RING SET.	4	2953AA
355	EXPANSION PIN.	4	1193PP
359	PIPE PLUG.	6	2606D
360	LOCK WASHER (PAIR).	4	3004C
361	WASHER.	4	13265B
363	NUT.	8	2797A
366A	HEX HEAD CAP SCREW, SEPARATE VOL. & CAP COVERS.	24	2796N
366B	HEX HEAD CAP SCREW, ONE PIECE CAST COVER.	24	2796B

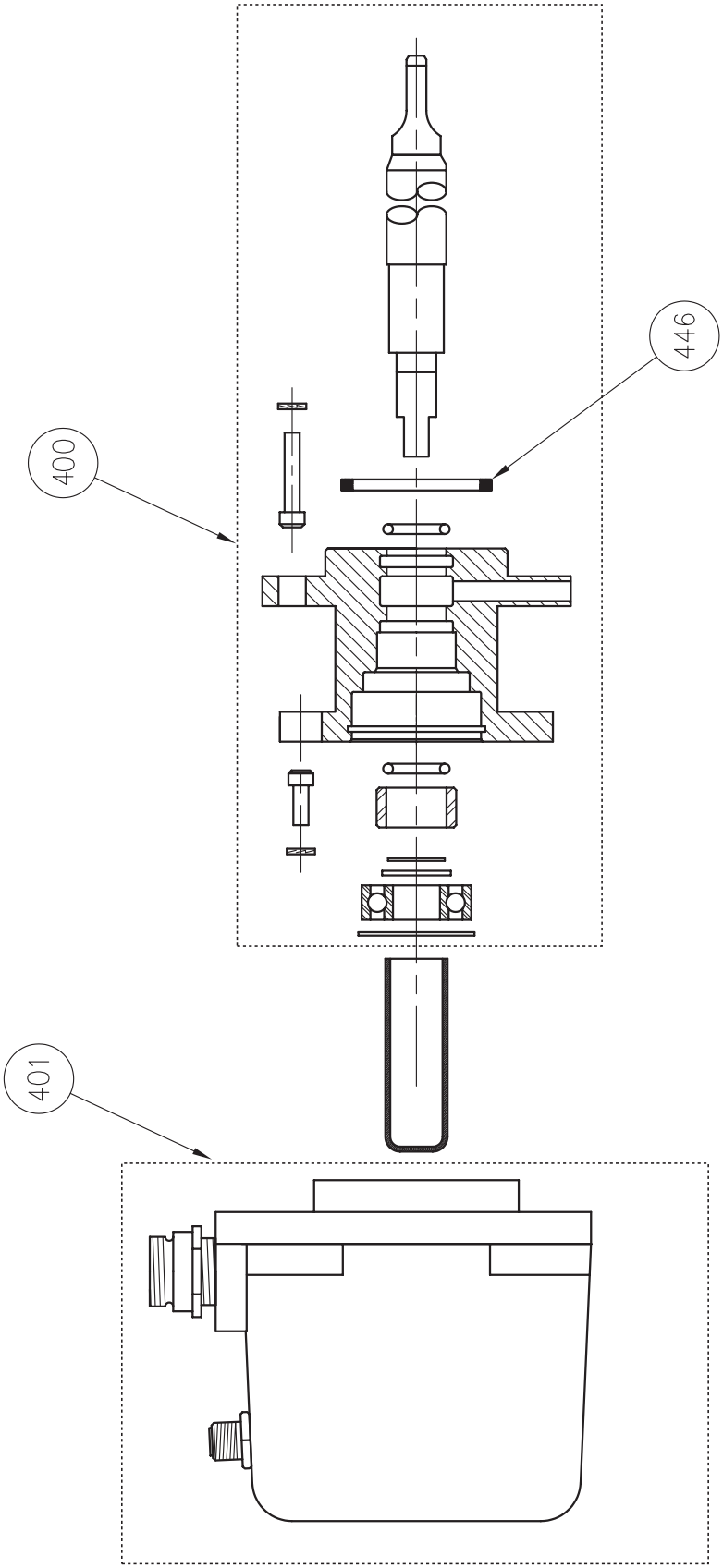
Slide Valve Carriage Assembly

ITEM	DESCRIPTION	MODEL NUMBER							
		VSG 751		VSG 901		VSG 1051		VSG 1201	
		QTY	VPN	QTY	VPN	QTY	VPN	QTY	VPN
300	CARRIAGE ASSEMBLY.	2	A25179C	2	A25179C	2	A25179D	2	A25179D
304	CAPACITY PISTON 340, 341, 350 & 355.	2	A25183C	2	A25183C	2	A25183D	2	A25183D
305	VOLUME PISTON 340, 342, 350 & 355.	2	A25184C	2	A25184C	2	A25184D	2	A25184D
307	GASKET SET 345B & 378**.	2	A25200C	2	A25200C	2	A25200D	2	A25200D
316	RACK.	2	25080A	2	25080A	2	25080C	2	25080C
323	RACK.	2	25080B	2	25080B	2	25080D	2	25080D
340	PISTON.	4	25076A	4	25076A	4	25138A	4	25138A
341	CAPACITY PISTON SHAFT.	2	25078A	2	25078A	2	25078E	2	25078E
342	VOLUME PISTON SHAFT.	2	25078B	2	25078B	2	25078F	2	25078F
343A	COVER, SEPARATE VOL. & CAP.	2	25123B	2	25123B	4	25123C	4	25123C
343B	COVER, ONE PIECE CAST.	2	25279A	2	25279A	2	25401A	2	25401A
344	COVER, SEPARATE VOL. & CAP.	2	25123A	2	25123A	n/a	n/a	n/a	n/a
345A	GASKET, SEPARATE VOL. & CAP COVERS.	2	25124B	2	25124B	4	25124C	4	25124C
345B	GASKET ONE PIECE CAST COVER.	2	25902A	2	25902A	2	25901A	2	25901A
346	GASKET, SEPARATE VOL. & CAP COVERS.	2	25124A	2	25124A	n/a	n/a	n/a	n/a
347	PISTON SLEEVE.	2	25079A	2	25079A	n/a	n/a	n/a	n/a
350	PISTON RING SET.	4	2953AB	4	2953AB	4	2953AC	4	2953AC
355	EXPANSION PIN.	4	1193PP	4	1193PP	4	1193PP	4	1193PP
359	PIPE PLUG.	6	2606D	6	2606D	6	2606E	6	2606E
360	LOCK WASHER (PAIR).	4	3004C	4	3004C	4	3004C	4	3004C
361	WASHER.	4	13265B	4	13265B	4	13265B	4	13265B
363	NUT.	8	2797A	8	2797A	8	2797A	8	2797A
366A	HEX HEAD CAP SCREW.	12	2796B	12	2796B	24	2796B	24	2796B
366B	HEX HEAD CAP SCREW.	12	2796P	12	2796P	24	2796P	24	2796P
367	HEX HEAD CAP SCREW.	12	2796BN	12	2796BN	n/a	n/a	n/a	n/a
373	SOCKET HEAD CAP SCREW.	6	2795N	6	2795N	6	2795P	6	2795P
374	LOCK WASHER (PAIR).	6	3004C	6	3004C	6	3004D	6	3004D
378	0-RING.	2	2176Y	2	2176Y	n/a	n/a	n/a	n/a
380	RETAINER RING.	2	2866C	2	2866C	n/a	n/a	n/a	n/a

Slide Valve Carriage Assembly

ITEM	DESCRIPTION	MODEL NUMBER VSG 1551 to 2101	
		QTY	VPN
300	CARRIAGE ASSEMBLY.	2	A25179E
304	CAPACITY PISTON 340, 341, 350 & 355	2	A25183E
305	VOLUME PISTON 340, 342, 350 & 355	2	A25184E
307	GASKET SET 345 & 378.	2	A25200E
316	RACK.	2	25779A
323	RACK.	2	25780A
325	SHAFT.	2	25778A
340	PISTON.	4	25782A
341	CAPACITY PISTON SHAFT.	2	25784A
342	VOLUME PISTON SHAFT.	2	25783A
343B	COVER.	2	25690A
345B	GASKET.	2	25384A
347	PISTON SLEEVE.	4	25786A
350	PISTON RING SET.	4	2953AD
355	EXPANSION PIN.	4	1193PP
359	PIPE PLUG.	6	2606E
360	LOCK WASHER (PAIR).	4	3004C
361	WASHER.	4	13265B
363	NUT.	8	2797A
366B	HEX HEAD CAP SCREW.	28	2796BL
373	SOCKET HEAD CAP SCREW.	6	2795AG
374	LOCK WASHER (PAIR).	6	3004D
378	0-RING.	4	2176AG
380	RETAINER RING.	4	2755AG

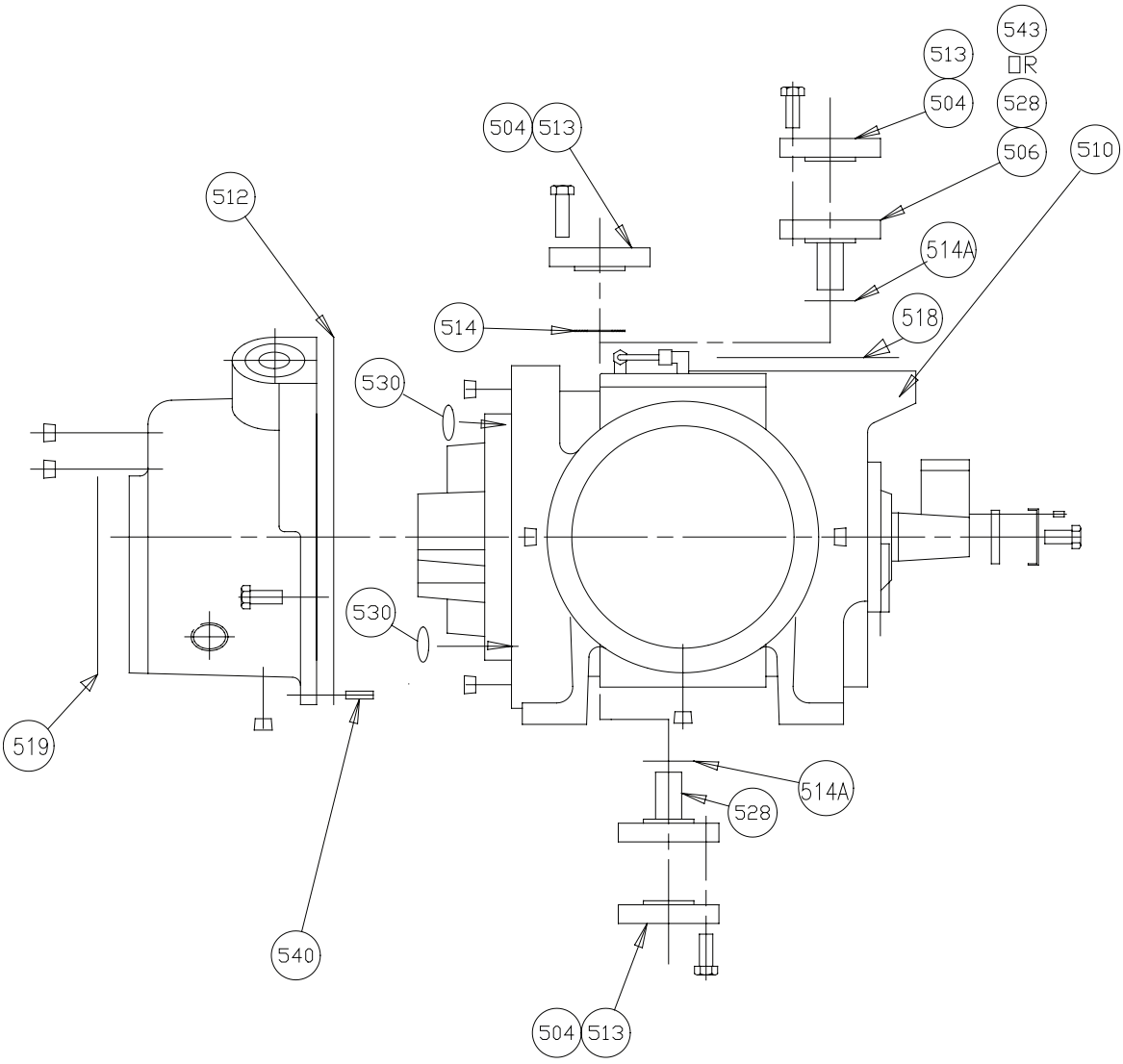
Actuator & Command Shaft



Actuator & Command Shaft

ITEM	DESCRIPTION	MODEL NUMBER VSSG 291 thru VSSG 601 QTY	VPN	VSG 751 thru VSSG 901 VPN	VSG 1051 thru VSG 1201 VPN	VSG 1551 thru VSG 2101 VPN
400	COMMAND SHAFT ASSEMBLY	2	A25994B	A25994C	A25994D	A25994E
401	SLIDEVALVE ACUATOR	2	25972D	25972D	25972D	25972D
446	O-RING	2	2176X	2176X	2176X	2176X

VSG Screw Compressor



Miscellaneous Frame Components

ITEM	DESCRIPTION	MODEL NUMBER VSSG 291 thru VSSG 601	
		QTY	VPN
	GASKET AND O-RING KIT;	1	KT710A1
504	FLANGE SET 513, 514 & 547A.	1	A25190A
506	ECON-O-MIZER PORT.	2	A25190B
512	MANIFOLD GASKET.	1	25503A
513	FLANGE OIL.	1	25058A
513	AFLANGE ECON-O-MIZER.	2	25058A
514	FLANGE GASKET OIL.	1	11323D
514A	FLANGE GASKET ECON-O-MIZER.	2	11323D
518	SUCTION FLANGE GASKET.	1	25199C
519	DISCHARGE FLANGE GASKET.	1	25199B
524	COVER.	n/a	n/a
525	GASKET.	n/a	n/a
527	INLET SCREEN.	n/a	n/a
528	ECON-O-MIZER PLUG.	n/a	n/a
530	O-RING	2	2176AB
532	O-RING	n/a	n/a
535	PIPE PLUG $^{1}/_{4}$" MPT.	n/a	n/a
539	PIPE PLUG.	n/a	n/an/an/a
540	DOWEL PIN.	2	2868B
545	HEX HEAD CAP SCREW FOR OIL	n/a	n/a
	SUPPLY FLANGE.	2	2796C
545	HEX HEAD CAP SCREW FOR	n/a	n/a
	ECON-O-MIZER FLANGE.	4	2796C
547	HEX HEAD CAP SCREW.	8	2796C
552	HEX HEAD CAP SCREW.	n/a	n/a
552	HEX HEAD CAP SCREW.	n/a	n/a
553	HEX HEAD CAP SCREW.	n/a	n/a
650	O-RING.	n/a	n/a
651	O-RING.	n/a	n/a

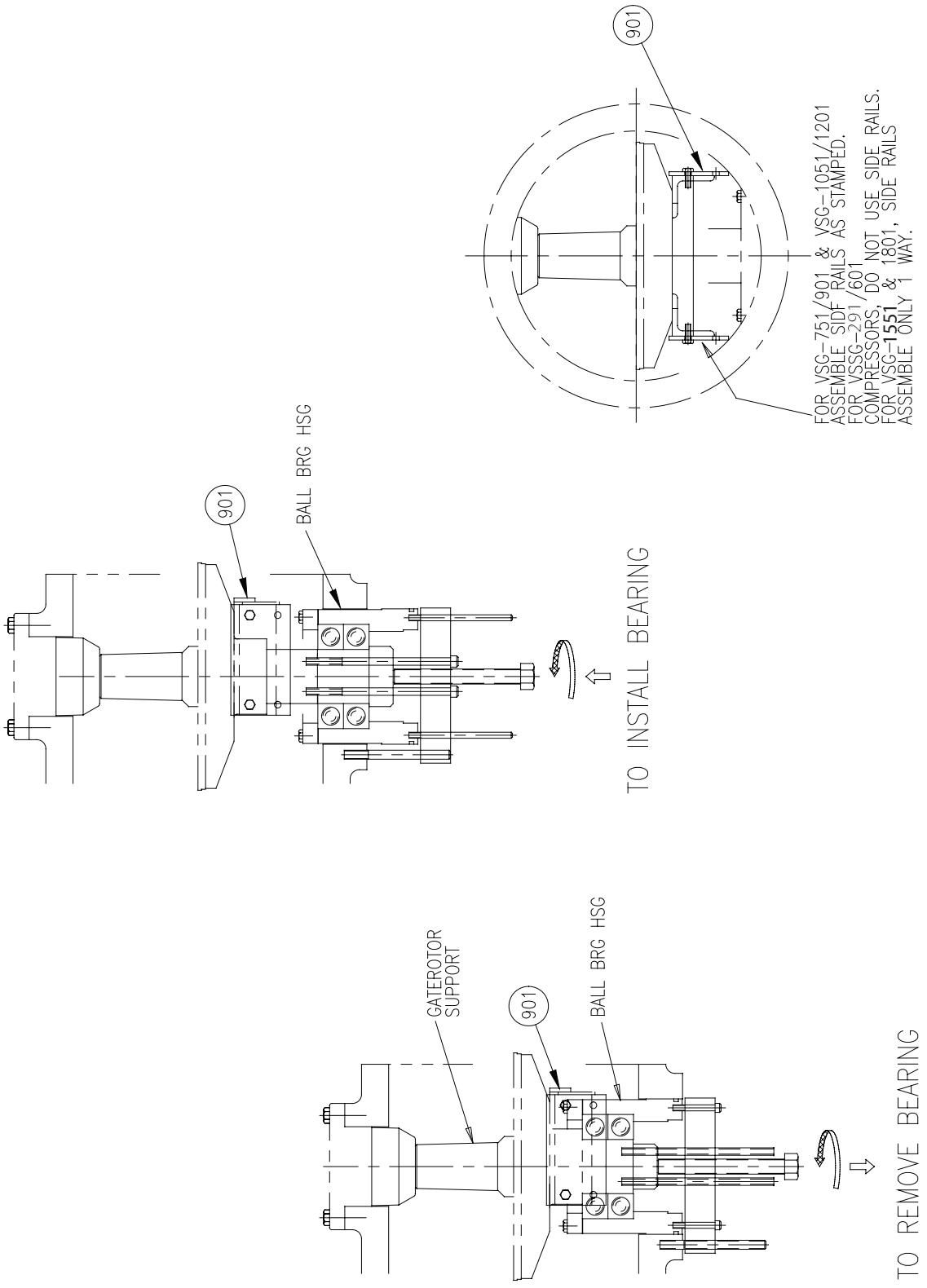
Miscellaneous Frame Components

ITEM	DESCRIPTION	MODEL NUMBER							
		VSG 751		VSG 901		VSG 1051		VSG 1201	
		QTY	VPN	QTY	VPN	QTY	VPN	QTY	VPN
	GASKET AND O-RING KIT;	1	KT710B	1	KT710B	1	KT710C	1	KT710C
504	FLANGE SET 513, 514 & 547.	1	A25190A	1	A25190A	1	A25190B	1	A25190B
512	MANIFOLD GASKET.	1	25541A	1	25541A	1	25324A	1	25324A
513	FLANGE OIL.	1	25058A	1	25058A	1	25058B	1	25058B
514	FLANGE GASKET OIL.	1	11323D	1	11323D	1	11323E	1	11323E
518	SUCTION FLANGE GASKET.	1	25199C	1	25199C	1	25199D	1	25199D
519	DISCHARGE FLANGE GASKET.	1	25199B	1	25199B	1	25199C	1	25199C
526	ORIFICE PLATE.	1	25223CB	1	25223CA	1	25223DB	1	25223DB
529	WAVE SPRING.	1	2912E	1	2912E	1	2912E	1	2912E
530	O-RING	2	2176J	2	2176J	2	2176J	2	2176J
538	PIPE PLUG 3/4” MPT.					6	2606A	6	2606A
540	DOWEL PIN.	2	2868B	2	2868B	2	2868B	2	2868B
547	HEX HEAD CAP SCREW.	21	2796GP	21	2796GP	24	2796GP	24	2796GP
554	HEX HEAD CAP SCREW.	1	2796U	1	2796U	1	2796U	1	2796U

Miscellaneous Frame Components

ITEM	DESCRIPTION	MODEL NUMBER VSG 1551 THRU VSG 2101	
		QTY	VPN
	GASKET AND O-RING KIT;	1	KT710D
504	FLANGE SET 513, 514 & 547.	1	A25190C
504	FLANGE SET 513A, 514A & 547 ECON-O-MIZER PORT.	2	A25190D
512	MANIFOLD GASKET.	1	25676A
513	FLANGE OIL.	1	12477C
513A	FLANGE ECON-O-MIZER.		
514	FLANGE GASKET OIL.	1	11323F
514A	FLANGE GASKET ECON-O-MIZER.		
518	SUCTION FLANGE GASKET.	1	25199D
519	DISCHARGE FLANGE GASKET.	1	25199C
530	O-RING	2	2176J
538	PIPE PLUG 3/4” MPT.	3	2606A
540	DOWEL PIN.	2	2868K
542	PIPE PLUG 3/4” MPT.	1	13163F
545	HEX HEAD CAP SCREW FOR OIL SUPPLY FLANGE.	4	11397E

NOTE: *Not pictured
**For VSS 1801 Serial Numbers 819, 820 & 821 only.


901
FOR VSG-751/901 & VSG-1051/1201
ASSEMBLE SIDE RAILS AS STAMPED.
FOR VSSG-291/601
COMPRESSORS, DO NOT USE SIDE RAILS.
FOR VSG-1551 & 1801, SIDE RAILS
ASSEMBLE ONLY 1 WAY.
901
BALL BRG HSG
TO INSTALL BEARING
GATEROTOR
SUPPORT
901
BALL BRG HSG
TO REMOVE BEARING

ITEM	DESCRIPTION	MODEL NUMBER VSSG 291 thru VSSG 601	
		QTY	VPN
900	GATEROTOR TOOLS (901, 910, 911, 912, 913, 914, 915, 916 & 917).	1	A25205B
901	GATEROTOR STABILIZER SET (901A, 901B & 901C).	1	A25698A

ITEM	DESCRIPTION	MODEL NUMBER							
		VSG 751		VSG 901		VSG 1051		VSG 1201	
		QTY	VPN	QTY	VPN	QTY	VPN	QTY	VPN
900	GATEROTOR TOOLS (901, 910, 911, 912, 913, 914, 915, 916 & 917).	1	A25205C	1	A25205C	1	A25205C	1	A25205C
901	GATEROTOR STABILIZER SET (901A, 901B & 901C).	1	A25698A	1	A25698A	1	A25698A	1	A25698A

ITEM	DESCRIPTION	MODEL NUMBER VSG 1551 thru VSG 2101	
		QTY	VPN
900	GATEROTOR TOOLS (901, 910, 911, 912, 913, 914, 915, 916 & 917).	1	A25205E
901	GATEROTOR STABILIZER SET (901A, 901B, 901C & 901D).	1	A25699A

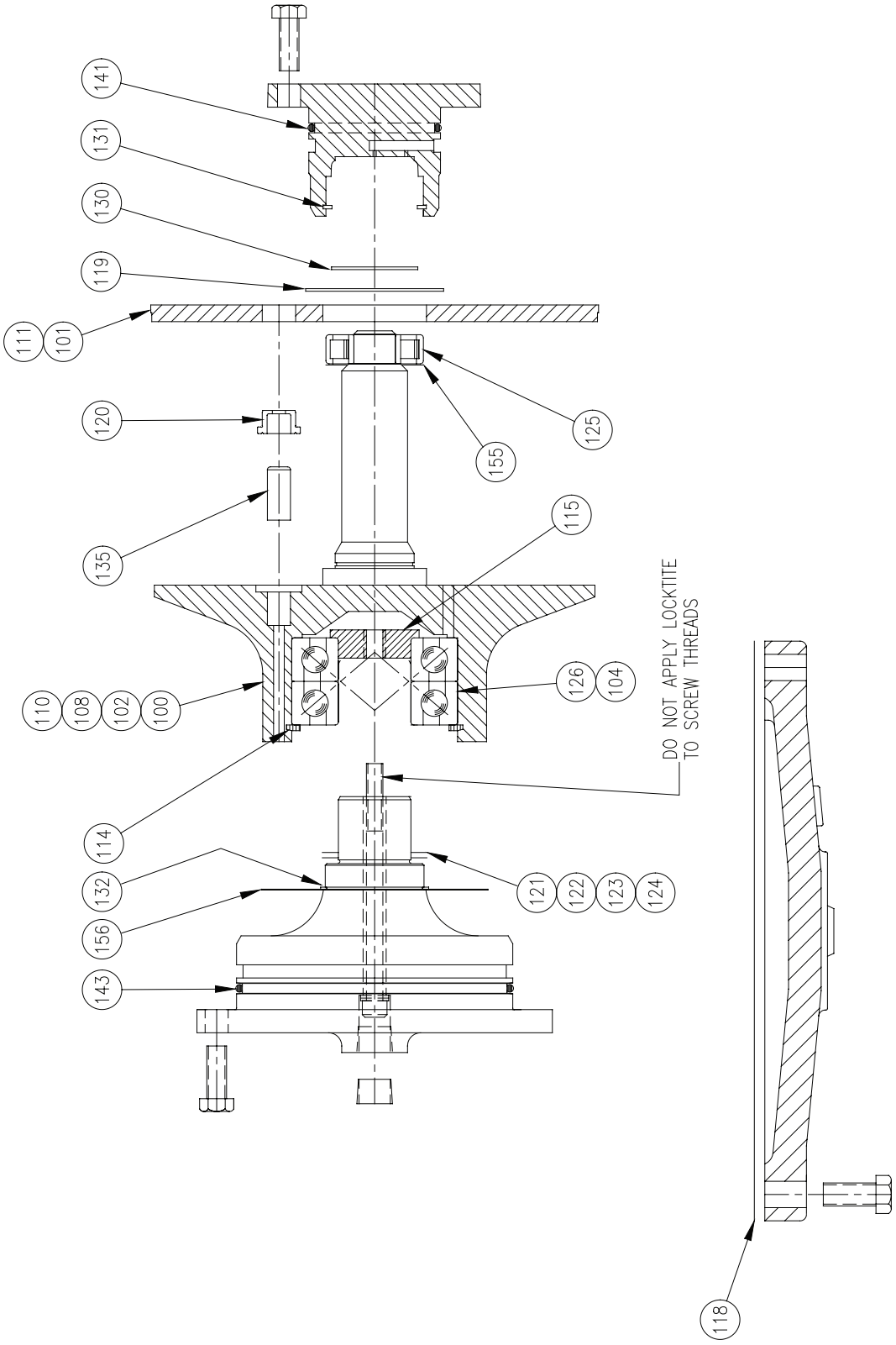
Recommended
Spare Parts List

Refer to the Custom Manual
Spare Parts Section for Specific Applications

Please have your Model # and Sales Order # available when ordering.

These are found on the compressor's Name Plate.

Gaterotor Assembly



Gaterotor Assembly

Part totals indicated are for one gate rotor assembly, machines with two gate rotors will require double the components listed below.

ITEM	DESCRIPTION	MODEL NUMBER					
		VSG 301		VSG 361		VSG 401	
		QTY	VPN	QTY	VPN	QTY	VPN
100	SUPPORT ASSEMBLY 110 & 135B.	1	A25222AB	1	A25222AA	1	A25222AC
101	GATE ROTOR & DAMPER ASSEMBLY 111,120.	1	A25160AB	1	A25160AA		A25160AC
102	GATE ROTOR SUPPORT ASSEMBLY 100, 101, 119 & 130.	1	A25161AB	1	A25161AA		A25161AC
	SHIM PACK SET (2) 121, (2) 122, (1) 123, (1) 124.	1	A25165A	1	A25165A		A25165A
110	SUPPORT.	1	25723D	1	25723C	1	25723B
111	GATE ROTOR.	1	25718B	1	25718C	1	25718D
114	SNAP RING.	1	2867L	1	2867L	1	2867L
115	RETAINER BALL BEARING	1	25935A	1	25935A	1	25935A
118	GATE ROTOR COVER GASKET.	1	25259B	1	25259B	1	25259B
119	WASHER WAVE SPRING.	1	3203A	1	3203A	1	3203A
120	DAMPER.	1	25760A	1	25760A	1	25760A
121*	SHIM 0.002”.	ar	25921AA	ar	25921AA	ar	25921AA
122*	SHIM 0.003”.	ar	25921AB	ar	25921AB	ar	25921AB
123*	SHIM 0.005”.	ar	25921AC	ar	25921AC	ar	25921AC
124*	SHIM 0.010”.	ar	25921AD	ar	25921AD	ar	25921AD
125	ROLLER BEARING.	1	2864F	1	2864F	1	2864F
126	BALL BEARING.	2	2865L	2	2865L	2	2865L
130	RETAINING RING.	1	2866H	1	2866H	1	2866H
131	RETAINING RING.	1	2867S	1	2867S	1	2867S
132	RETAINING RING.	1	2866J	1	2866J	1	2866J
135	DOWEL PIN	1	25910A	1	25910A	1	25910A
141	O-RING ROLLER BRG HSG.	1	2176L	1	2176L	1	2176L
143	O-RING BALL BRG SUPPORT.	1	2176F	1	2176F	1	2176F
155	SHIM	ar	25977D	ar	25977D	ar	25977D
156	SHIM	ar	25977C	ar	25977C	ar	25977C

ar = As required

Gaterotor Assembly

Part totals indicated are for one gate rotor assembly, dual gate machines will require double the components.

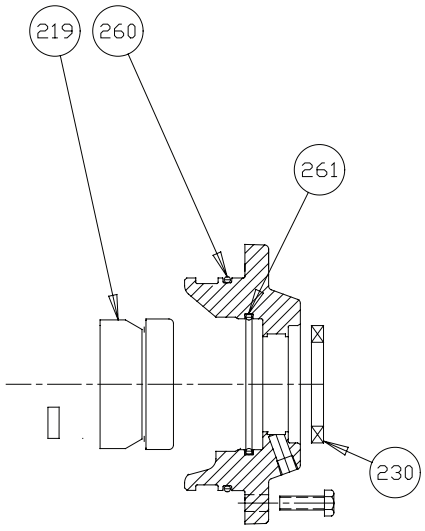
ITEM	DESCRIPTION	MODEL NUMBER					
		VSG 501		VSG 601		VSG 701	
		QTY	VPN	QTY	VPN	QTY	VPN
100	SUPPORT ASSEMBLY 110 & 135B.	1	A26011BB	1	A26011BA	1	A26011BA
101	GATE ROTOR & DAMPER ASSEMBLY 111,120.	1	A26002BB	1	A26002BA	1	A26002BC
102	GATE ROTOR SUPPORT ASSEMBLY 100, 101, 119 & 130.	1	A26003BB	1	A26003BA	1	A26003BC
	SHIM PACK SET (2) 121, (2) 122, (1) 123, (1) 124.	1	A26035B	1	A26035B	1	A26035B
110	SUPPORT.	1	26030BB	1	26030BA	1	26030BA
111	GATE ROTOR.	1	26032A	1	26031A	1	26033A
114	SNAP RING.	1	2867U	1	2867U	1	2867U
115	RETAINER BALL BEARING	1	25935B	1	25935B	1	25935B
118	GATE ROTOR COVER GASKET.	1	25259C	1	25259C	1	25259C
119	WASHER.	1	25007A	1	25007A	1	25007A
120	DAMPER.	1	25760A	1	25760A	1	25760A
121*	SHIM 0.002”.	ar	26027AA	ar	26027AA	ar	26027AA
122*	SHIM 0.003”.	ar	26027AB	ar	26027AB	ar	26027AB
123*	SHIM 0.005”.	ar	26027AC	ar	26027AC	ar	26027AC
124*	SHIM 0.010”.	ar	26027AD	ar	26027AD	ar	26027AD
125	ROLLER BEARING.	1	2864B	1	2864B	1	2864B
126	BALL BEARING.	1	2865B	1	2865B	1	2865B
130	RETAINING RING.	1	2866A	1	2866A	1	2866A
131	RETAINING RING.	1	2867A	1	2867A	1	2867A
132	RETAINING RING.	1	2866K	1	2866K	1	2866K
135	DOWEL PIN	1	25910A	1	25910A	1	25910A
141	O-RING ROLLER BRG HSG.	1	2176M	1	2176M	1	2176M
143	O-RING BALL BRG SUPPORT.	1	2176R	1	2176R	1	2176R
155	SHIM	ar	25977G	ar	25977G	ar	25977G
156	SHIM	ar	25977H	ar	25977H	ar	25977H

NOTE: * Not pictured
ar = As Required

Shaft Seal

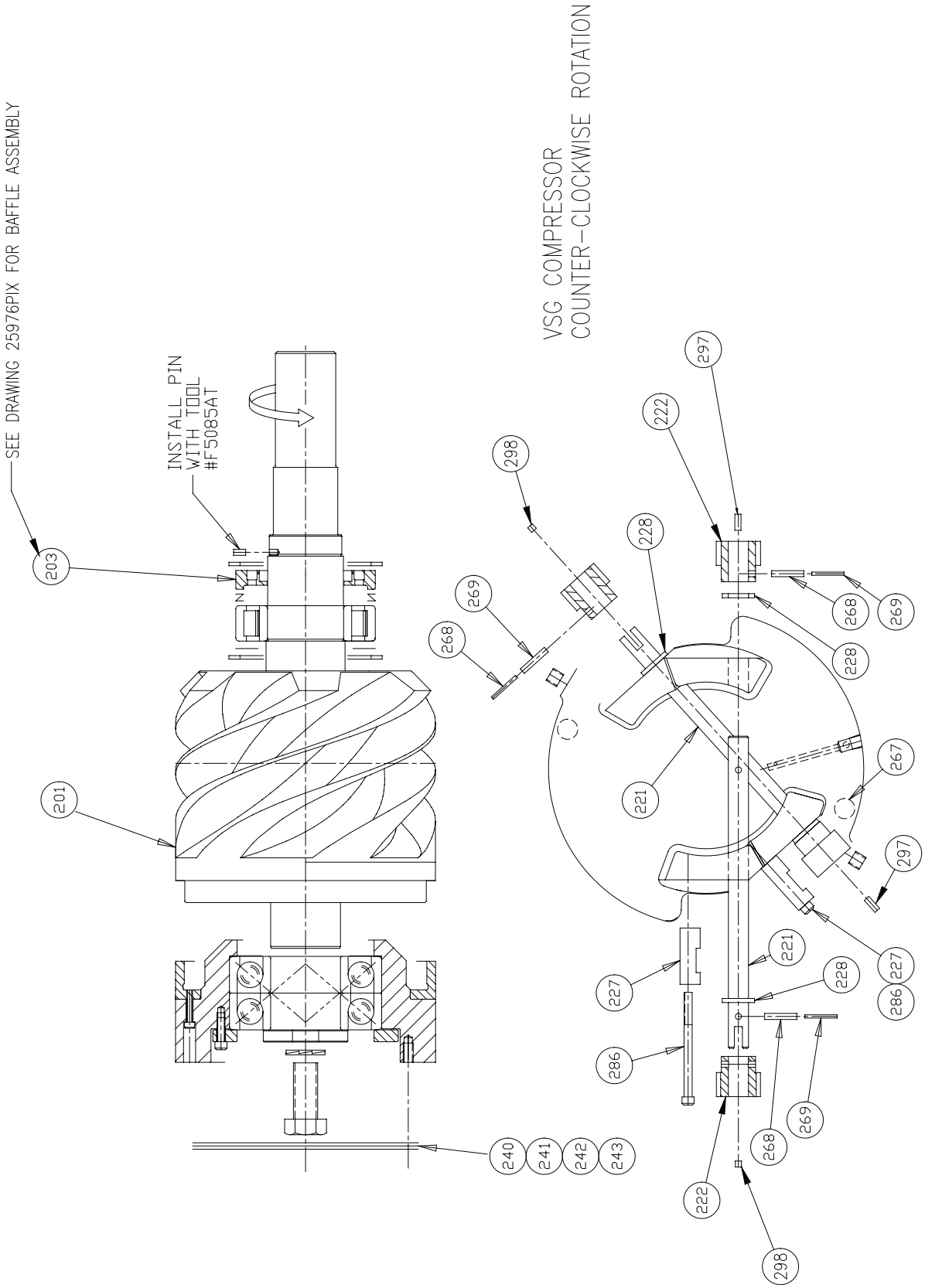
ITEM	DESCRIPTION	MODEL NUMBER			
		ALL VSG 301-401		ALL VSG 501-701	
		QTY	VPN	QTY	VPN
*	SHAFT SEAL KIT Viton Kit 219, 230, & 260.	1	KT709DG	1	KT709AG
219	SHAFT SEAL.	1	A	1	A
230	OIL SEAL.	1	2930C	1	25040A
244-	TEFLON SEAL	1	25939A	1	25939A
252-	RETAINER RING	1	2928M	1	2928M
260	O-RING	1	2176U	1	2176F
261	O-RING. (205 Only)	1	2176AE		n/a

NOTE * Not pictured.
A Sold only as kit.
- See recommended spare parts lists for complete assembly.



Main Rotor, Slide Valve Cross Shafts & End Plate

Models VSG301-401 Counter Clockwise ONLY



Main Rotor, Slide Valve Cross Shafts & End Plate

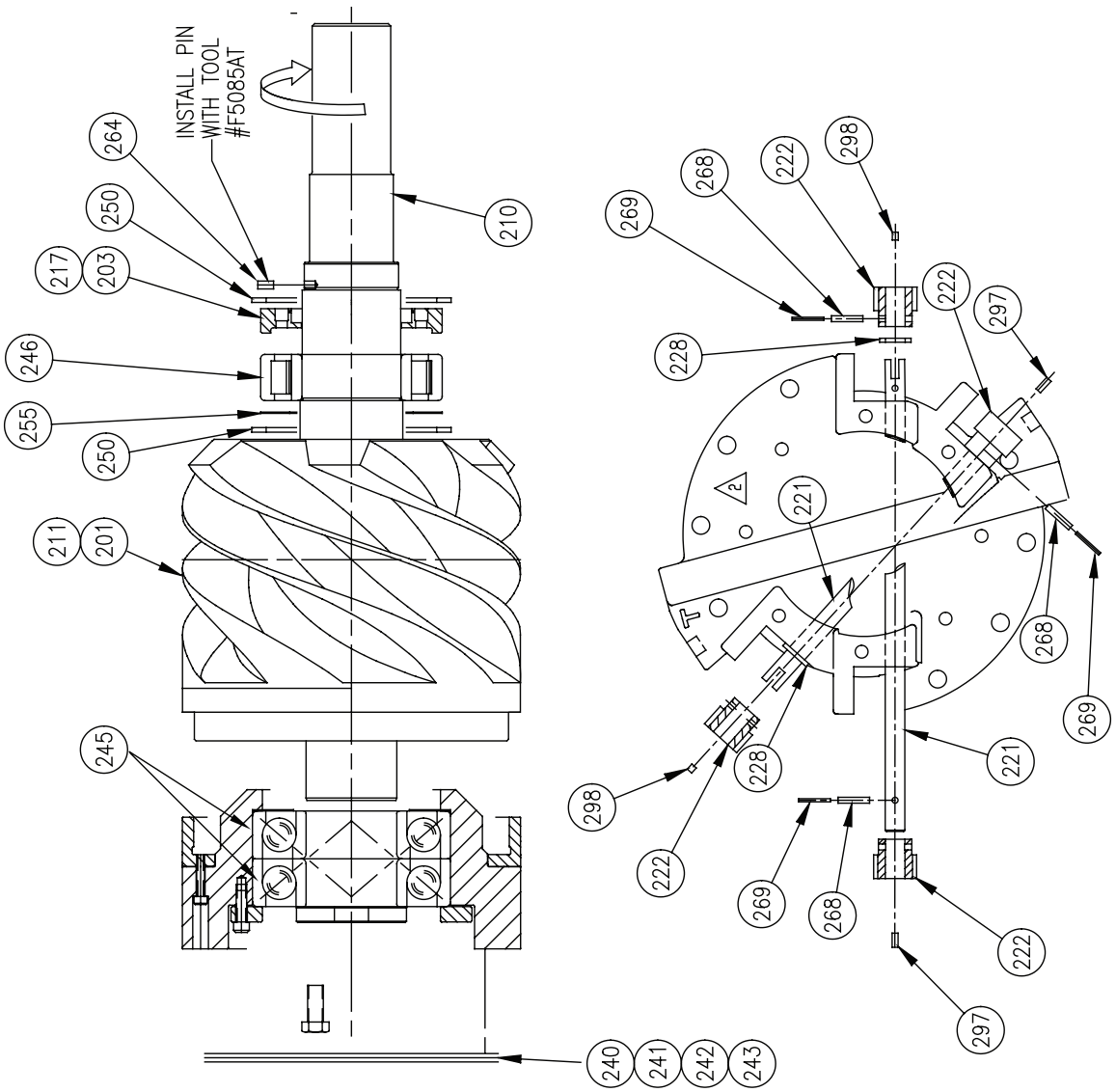
Models VSG301-401 Counter Clockwise ONLY

ITEM	DESCRIPTION	MODEL NUMBER					
		VSG 301		VSG 361		VSG 401	
		QTY	VPN	QTY	VPN	QTY	VPN
201	MAIN ROTOR ASSEMBLY.	1	A25226AB	1	A25226AA	1	A25226AC
203	OIL BAFFLE ASSEMBLY (1) 217, (1) 244, (1) 248, (1) 249, (1) 252.	1	A25942AA	1	A25942AA	1	A25942AA
	SHIM ASSORTMENT (2) 240, (2) 241, (1) 242, (1) 243	1	A25177A	1	A25177A	1	A25177A
217	OIL BAFFLE PLATE .	1	25938A	1	25938A	1	25938A
220	END PLATE.	1	25719D	1	25719D	1	25719D
221	SHAFT.	2	25941A	2	25941A	2	25941A
222	GEAR.	4	25027A	4	25027A	4	25027A
227	CLAMP.	4	25913A	4	25913A	4	25913A
228	SPACER.	4	25847A	4	25847A	4	25847A
240	SHIM 0.002”	A	25409AA	A	25409AA	A	25409AA
241	SHIM 0.003”	A	25409AB	A	25409AB	A	25409AB
242	SHIM 0.005”	A	25409AC	A	25409AC	A	25409AC
243	SHIM 0.010”	A	25409AD	A	25409AD	A	25409AD
244	TEFLON RING.	1	25939A	1	25939A	1	25939A
248	CHECK VALVE.	1	3120A	1	3120A	1	3120A
249	CHECK VALVE.	1	3120B	1	3120B	1	3120B
252	RETAINING RING	1	2829M	1	2829M	1	2829M
268	EXPANSION PIN.	4	1193D	4	1193D	4	1193D
269	EXPANSION PIN.	4	2981AA	4	2981AA	4	2981AA
271**	PLUG SOLID	1	25422A	1	25422A	1	25422A
281	HEX HEAD CAP SCREW.	6	2796N	6	2796N	6	2796N
286	SOCKET HEAD CAP SCREW.	8	2795F	8	2795F	8	2795F
297	SET SCREW.	2	2060J	2	2060J	2	2060J
298	SET SCREW.	2	2060H	2	2060H	2	2060H

NOTE: * Not pictured.
** Required at top locate single gaterotor only.
A As required.

Main Rotor, Slide Valve Cross Shafts & End Plate

Models VSG501-701 Clockwise ONLY



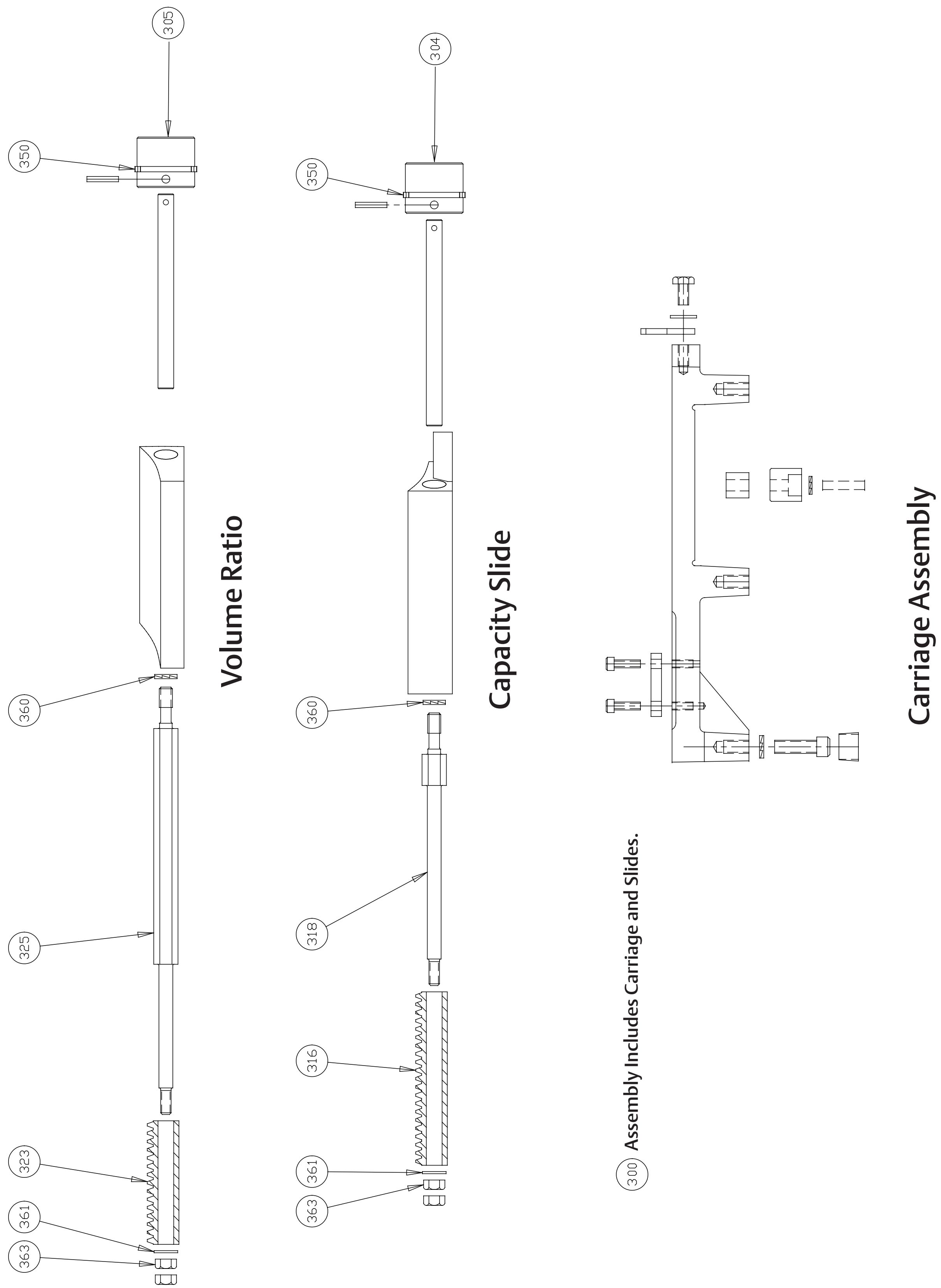
Main Rotor, Slide Valve Cross Shafts & End Plate

Models VSG501-701 Clockwise ONLY

ITEM	DESCRIPTION	MODEL NUMBER VSG 501		VSG 601		VSG 701	
		QTY	VPN	QTY	VPN	QTY	VPN
201	MAIN ROTOR ASSEMBLY.	1	A26010BB	1	A26010BA	1	A26010BC
203	OIL BAFFLE ASSEMBLY (1) 217, (1) 244, (1) 248, (1) 249, (1) 252.	1	A26034B	1	A26034B	1	A26034B
	SHIM ASSORTMENT (2) 240, (2) 241, (1) 242, (1) 243	1	A25177B	1	A25177B	1	A25177B
220	END PLATE.	1	26025B	1	26025B	1	26025B
221	SHAFT.	2	25843A	2	25843A	2	25843A
222	GEAR.	4	25027A	4	25027A	4	25027A
228	SPACER.	4	25847A	4	25847A	4	25847A
240	SHIM 0.002”	A	25255AA	A	25255AA	A	25255AA
241	SHIM 0.003”	A	25255AB	A	25255AB	A	25255AB
242	SHIM 0.005”	A	25255AC	A	25255AC	A	25255AC
243	SHIM 0.010”	A	25255AD	A	25255AD	A	25255AD
244	TEFLON RING.	1	25929B	1	25929B	1	25929B
248	CHECK VALVE.	1	3120A	1	3120A	1	3120A
249	CHECK VALVE.	1	3120B	1	3120B	1	3120B
252	RETAINING RING	1	2928N	1	2928N	1	2928N
255	WASHER	2	25977E	2	25977E	2	25977E
256	WASHER	2	25977F	2	25977F	2	25977F
268	EXPANSION PIN.	4	1193D	4	1193D	4	1193D
269	EXPANSION PIN.	4	2981AA	4	2981AA	4	2981AA
281	HEX HEAD CAP SCREW.	8	2796B	8	2796B	8	2796B
282	SOCKET HEAD CAP SCREW	2	2795D	2	2795D	2	2795D
297	SET SCREW.	2	2060J	2	2060J	2	2060J
298	SET SCREW.	2	2060H	2	2060H	2	2060H

NOTE: * Not pictured.
A As required.

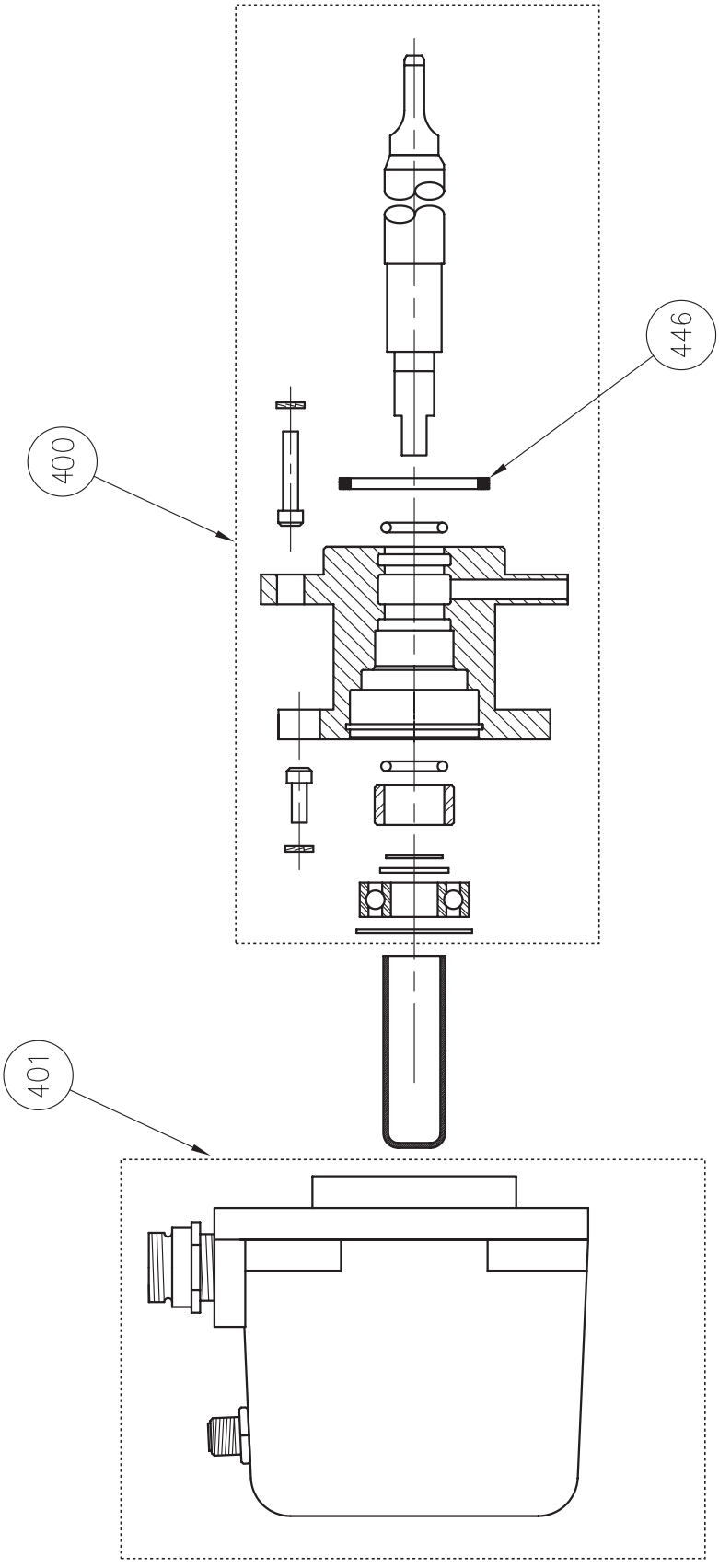
Slide Valve Carriage Assembly



Slide Valve Carriage Assembly

ITEM	DESCRIPTION	MODEL NUMBER			
		ALL VSG 301-401		ALL VSG 501-701	
		QTY	VPN	QTY	VPN
300	CARRIAGE ASSEMBLY.	1	A25179A	1	A26012B
304	CAPACITY PISTON 340, 341, 350 & 355	1	A25183A	1	A25183B
305	VOLUME PISTON 340, 342, 350 & 355.	1	A25184A	1	A25184B
316	CAPACITY RACK.	1	25023D	1	25024A
318	CAPACITY RACK SHAFT.	1	25772C	1	25772A
323	VOLUME RATIO RACK.	1	25023C	1	25023A
325	VOLUME RATIO RACK SHAFT.	1	25772D	1	25772B
350	PISTON RING SET.	2	2953AE	2	2953AA
360	LOCK WASHER (PAIR).	2	3004C	2	3004C
361	WASHER.	2	13265B	2	13265B
363	NUT.	4	2797A	4	2797A
372*	SOCKET HEAD CAP SCREW.		N/A	1	2795M

Notes:There are two slide valve carriages per compressor. Each one each has its own Volume Ratio and Capacity slide valves. The above totals are per side of the compressor, double the quantities if both slide valve carriages are being worked on.
*.Not Pictured.

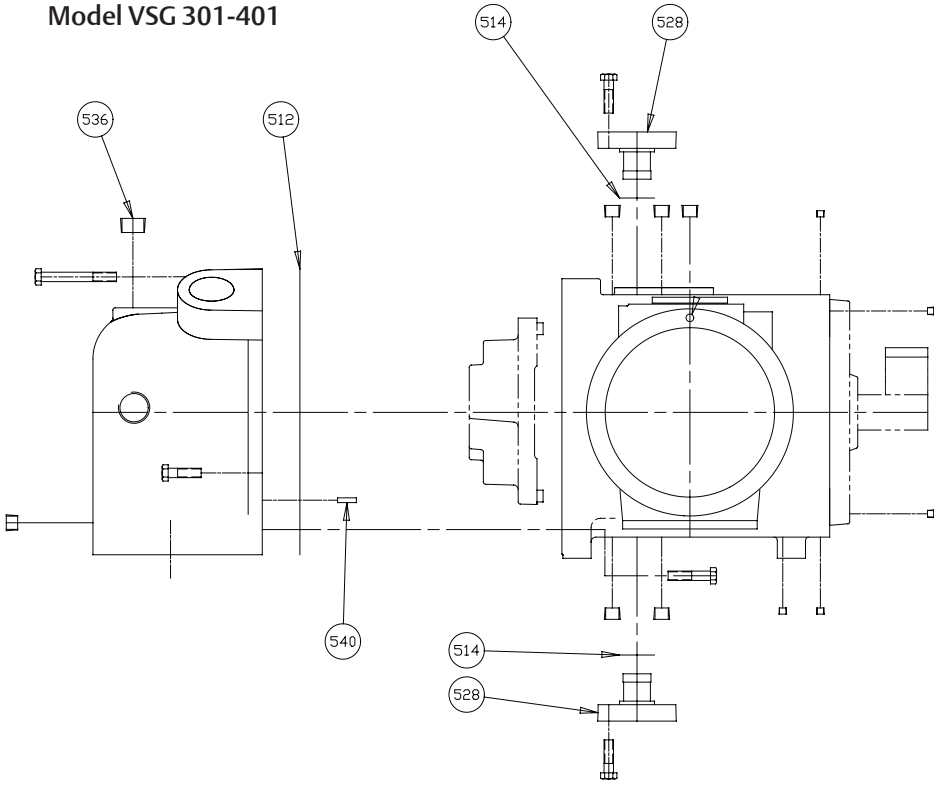

446
400
401

Actuator & Command Shaft

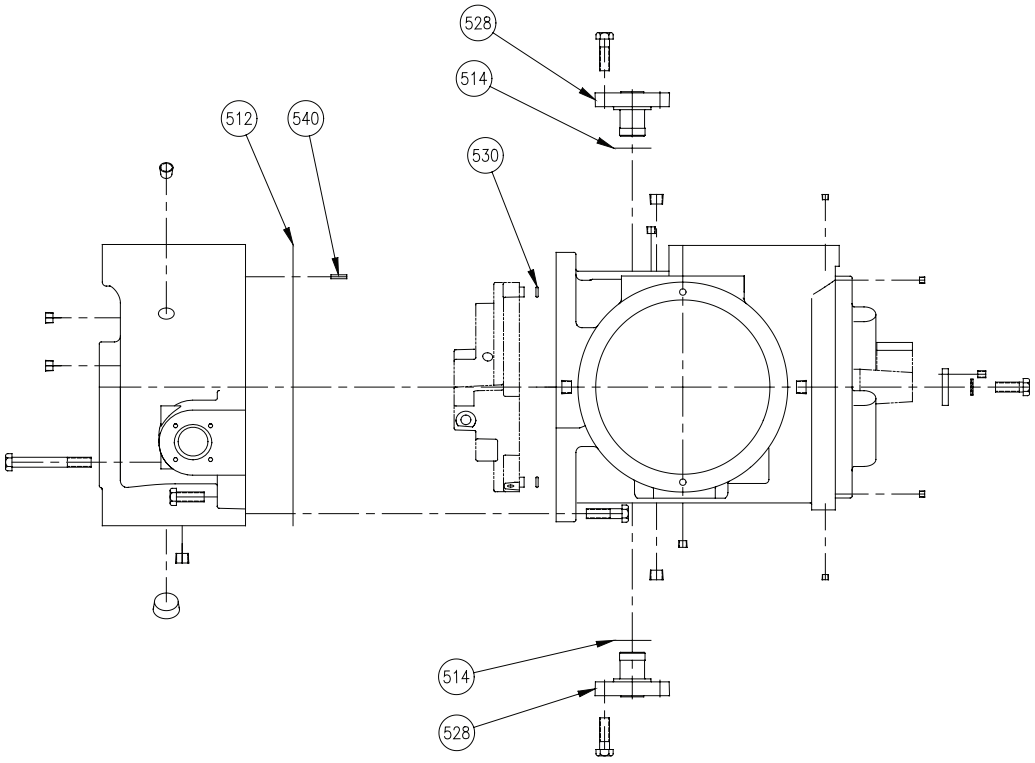
ITEM	DESCRIPTION	MODEL NUMBER VSSG 291 thru VSSG 601 QTY	VPN	VSG 751 thru VSSG 901 VPN	VSG 1051 thru VSG 1201 VPN	VSG 1551 thru VSG 2101 VPN
400	COMMAND SHAFT ASSEMBLY	2	A25994B	A25994C	A25994D	A25994E
401	SLIDEVALVE ACUATOR	2	25972D	25972D	25972D	25972D
446	O-RING	2	2176X	2176X	2176X	2176X

Miscellaneous Frame Components

Model VSG 301-401



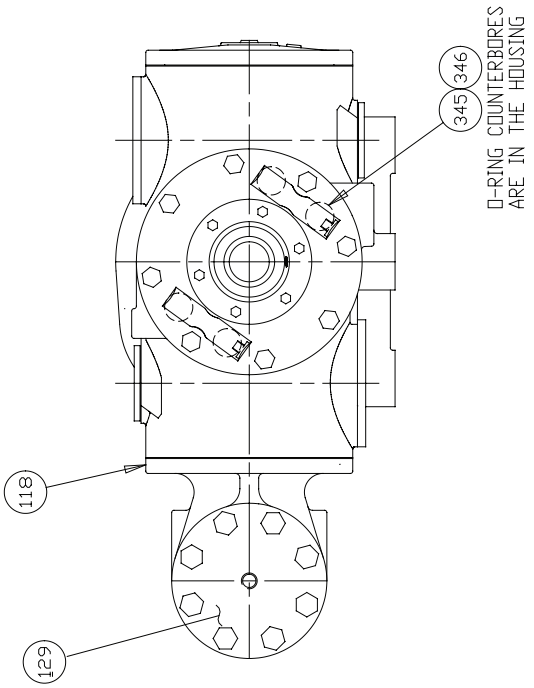
Model VSG 501-701

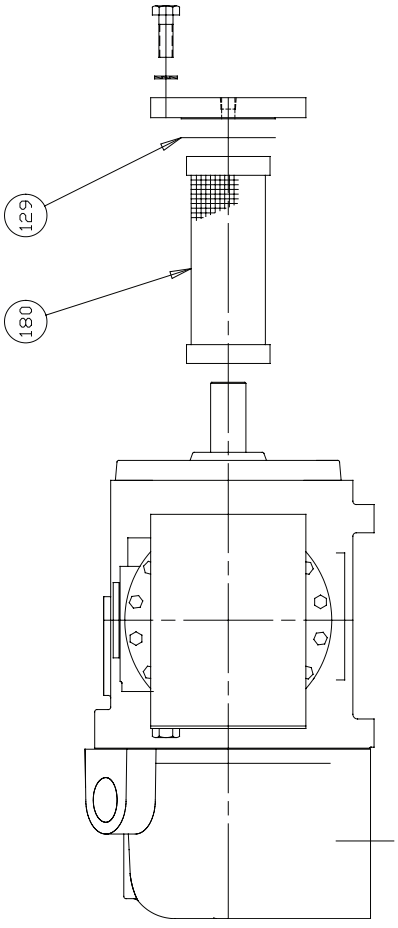


Miscellaneous Frame Components

ITEM	DESCRIPTION	MODEL NUMBER			
		ALL VSG 301-401		ALL VSG 501 - 701	
		QTY	VPN	QTY	VPN
512	MANIFOLD GASKET	1	25737A	1	26037A
514	ECON-O-MIZER GASKET	2	11323GG	2	11323D
522	COUPLING LOCK PLATE	n/a		1	25004D
523	LOCK WASHER	n/a		1	3004H
528	ECON-O-MIZER PLUG	2	25419A	2	25397K
530	O-RING	n/a		2	2176BF
540	DOWEL PIN	2	2868B	2	2868B
542	PIPE PLUG	3	2606C	10	2606B
551	HEX HEAD CAP SCREW	n/a		2	2796C
570	BEARING OIL PLUG	1	25978A	n/a	
571	PLUG	1	25979A	n/a	
572	SPRING	1	3148A	n/a	

Notes*. Not Pictured





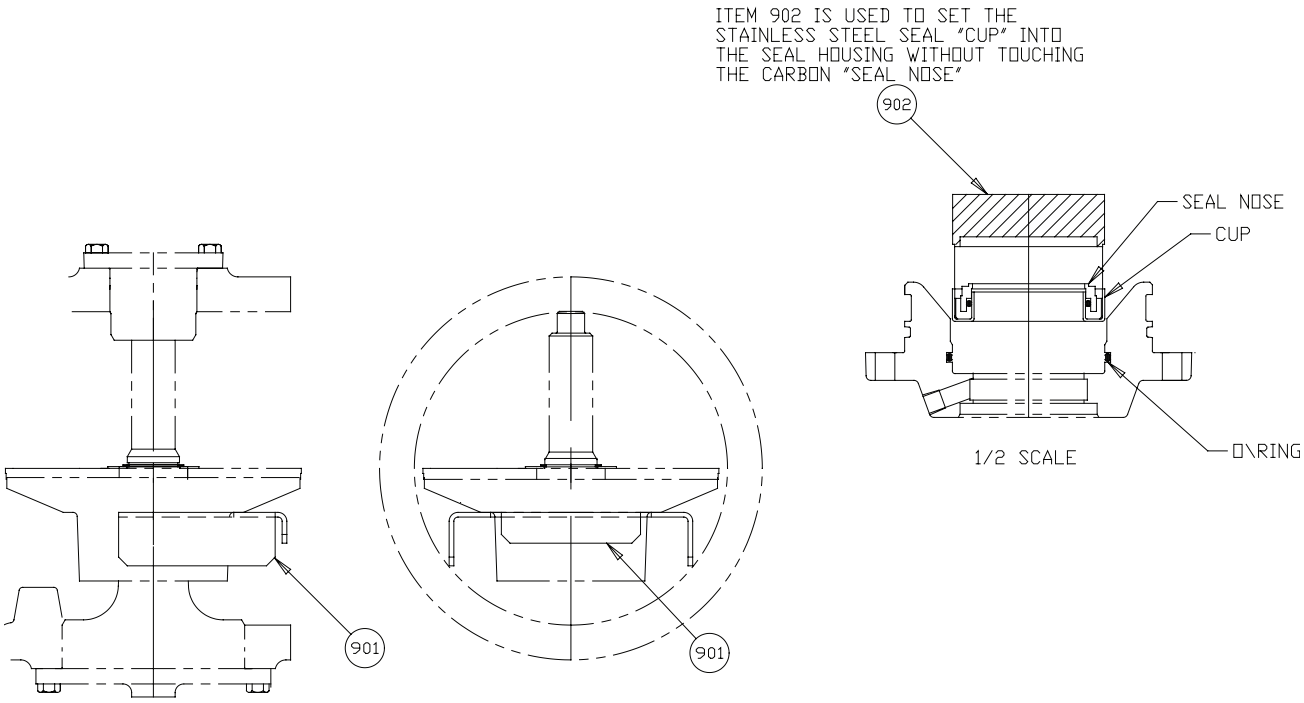
Housing Accessories

Housing Accessories

ITEM	DESCRIPTION	MODEL NUMBER VSG 301 - 701	
		QTY	VPN
117	GATE ROTOR COVER.	1	25416B
118	COVER GASKET.	2	25259B
129	GASKET.	1	11323T
180	INLET SCREEN.	1	25920A
343	PISTON COVER. *	1	25724B

ITEM	DESCRIPTION	MODEL NUMBER VSG 301 - 401		VSG 501 - 701	
		QTY	VPN	QTY	VPN
345	O-RING.	4	2176BX	4	2176CA
346	O-RING.	2	2176BG	2	2176BG

Replacement Tools



ITEM	DESCRIPTION	MODEL NUMBER			
		ALL VSG 301-401		ALL VSG 501-701	
		QTY	VPN	QTY	VPN
901	GATEROTOR STABILIZER.	1	25742A	1	25742B
902	SEAL INSTALLATION TOOL	1	25455A	1	25455B

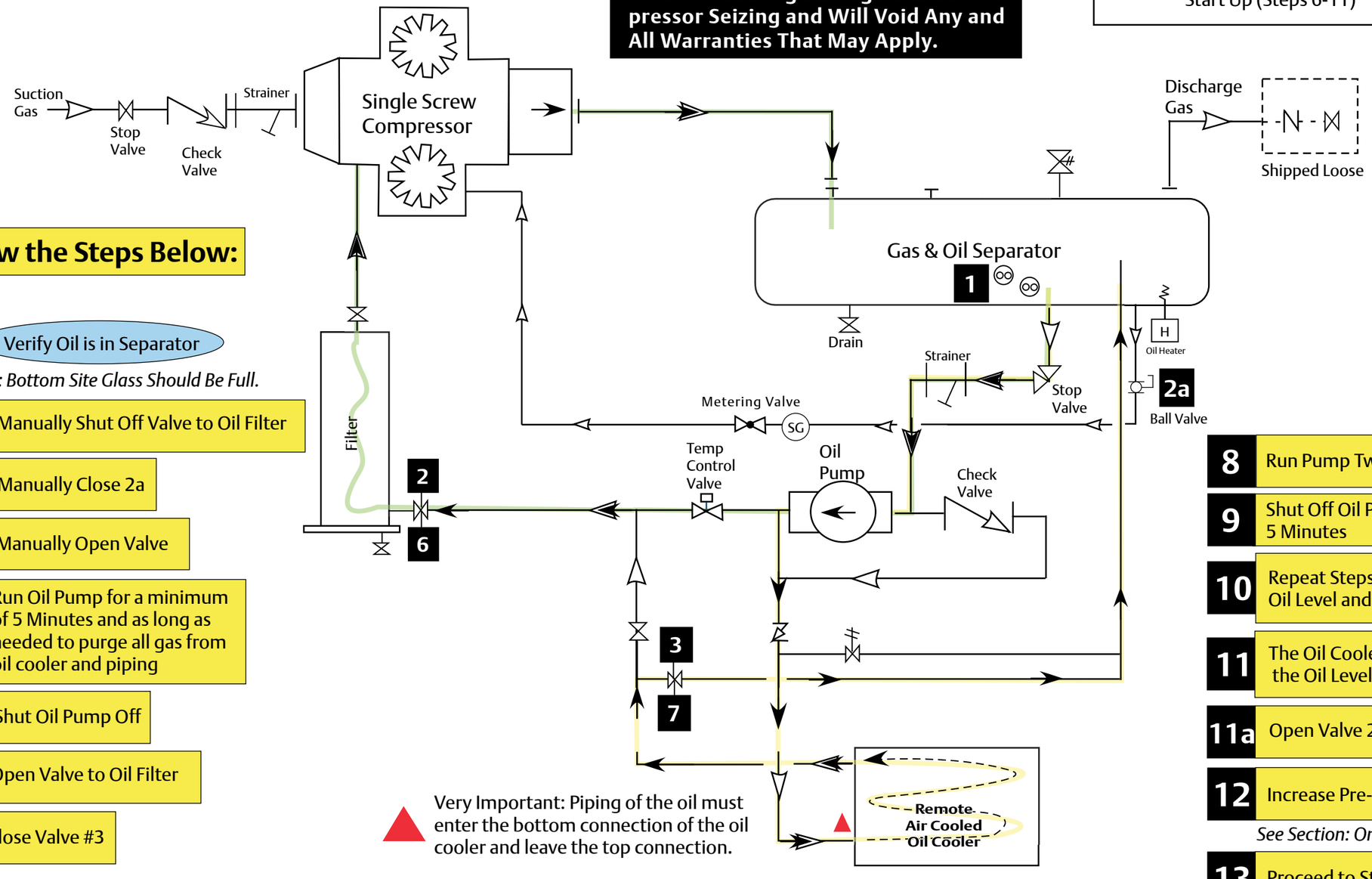
Remote Coolers Only

Pre Start Up for Proper Oil Separator Level and to Prime the Cooler

WARNING

Failure to Follow These Steps Will Result in Bearing Damage and Compressor Seizing and Will Void Any and All Warranties That May Apply.

Shows the Flow for Priming the Oil Cooler (Steps 1-5)
Shows the Flow for Priming the Compressor Prior to Start Up (Steps 6-11)



Follow the Steps Below:

1. Verify Oil is in Separator

Note: Bottom Site Glass Should Be Full.

2. Manually Shut Off Valve to Oil Filter

2a. Manually Close 2a

3. Manually Open Valve

4. Run Oil Pump for a minimum of 5 Minutes and as long as needed to purge all gas from oil cooler and piping

5. Shut Oil Pump Off

6. Open Valve to Oil Filter

7. Close Valve #3

Very Important: Piping of the oil must enter the bottom connection of the oil cooler and leave the top connection.

8. Run Pump Two Times for Only 1-2 Minutes

9. Shut Off Oil Pump and Wait an Additional 5 Minutes

10. Repeat Steps 2-9 Until Oil Separator is at Proper Oil Level and Oil Cooler is Primed

11. The Oil Cooler is Considered Primed When the Oil Level (Separator) is Constant

11a. Open Valve 2a

12. Increase Pre-Lube Time to 10 Seconds

See Section: On Set Points In Compact Logix Manual.

13. Proceed to Start-Up

See Section: On Start Up Check List In Manual.

IMPORTANT! FOR REMOTE OIL COOLERS ONLY. READ BEFORE PROCEEDING.

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